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Main Contents :

SUMMARY OF RECENT ABSTRACTS.

VII. HELMINTHIASIS.—*Concluded.*

HELMINTHIASIS.

RABIES.

TRYPANOSOMIASIS.

RELAPSING FEVER AND OTHER SPIROCHAETOSES.

LEPTOSPIROSIS.

RAT-BITE FEVER.

MALARIA.

For detailed Contents see pp. ii, iv & vi.

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TROPICAL DISEASES BULLETIN.

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SUMMARY OF RECENT ABSTRACTS.

VII. HELMINTHIASIS.*

[continued from p. 616.]

Ankylostomiasis.—KANDELAKI and KAMALOV (p. 671) find heavy hookworm infection in Western Georgia, Russia, especially in districts of heavy rainfall. In one series 92 per cent. of the hookworms recovered after treatment proved to be *N. americanus*, the remainder were *A. duodenale*.

SCOTT (p. 273) estimates that of the twelve million rural inhabitants of Egypt about five million are infected with hookworm; in some villages the infection rate reaches 90 per cent. He details the techniques used in the investigation made and considers that estimations of worm burdens from egg count figures cannot usefully be made on account of the large errors involved. But he concludes that in general where a high proportion of infected persons is found there is a large number of worms in each infected person. He also (p. 274) discusses soil pollution in Egypt. It is common throughout the villages and in the fields, but possibly on account of dryness or excess of chlorides or some associated factor, the fine clay soils do not serve as good media, and few larvae can be found. Even when irrigation is carried out the moisture content often falls fairly low and the hot sun may kill the larvae. Defaecation is scattered, but, near water, soil infestation is widespread though seldom intense. These observations harmonize with the widespread but low grade human infection found.

KELLER *et al.* (p. 274) report that in comparison with investigations made by the Rockefeller Sanitary Commission in 1910–1914, their recent findings show a reduction in hookworm infection of between 33·7 per cent. and 27·3 per cent. in five of the United States. The peak incidence is between 15 and 19 years, and family infection is important. LANE states that the value of the comparison depends upon whether the techniques in the earlier and later investigations were identical and that, according to Stoll, whose method they used,

* The information from which this series of summaries has been compiled is given in the abstracts made by the Sectional Editors in the *Tropical Diseases Bulletin*, 1938, Vol. 35. References to the abstracts are given under the names of the authors quoted and the pages on which the abstracts are printed.

the amount of faeces examined by the authors was not enough for the detection of single worms.

Pessôa and Pascale (p. 276) examined 1,177 school-children by the Stoll-Hausheer technique in São Paulo and found 75·4 per cent. to be infected with Necator. A rather higher percentage was found in those living in houses not provided with latrines than in those so equipped.

Webb (p. 217), by systematic measurements of all hookworm-like eggs in the faeces of patients in Mauritius found 8 per cent. Trichostrongylus, 0·9 per cent. *Ternidens deminutus* and 0·9 per cent. *Ancylostoma braziliense*-like eggs. He records a patient infected with *Trichostrongylus axei*, normally a parasite of equines.

Taylor (p. 670) stores nematode larvae between damp filter papers in a sealed petri dish at 36°–40°C. After a year, 91 per cent. of the larvae are alive. Rudolfs (p. 672) cites unpublished evidence that a small percentage of hookworm eggs may survive sludge digestion under certain conditions. In Singapore effective destruction is ensured by heating digested sludge to 150°F. or more for at least 30 minutes.

Cimino (p. 276) lays stress on the value of dark blue pigmentation of the tongue as a diagnostic sign of ankylostomiasis, but Lane points out that this sign has been discredited for more than 30 years. Minamizaki (p. 672) shows that hookworm eggs appeared in the faeces 58 days after deliberately walking barefoot over farm land. Treatment failed to eliminate all worms, and eggs persisted for 7 years. Bonne (p. 277) describes five cases in which hookworms were found in the submucosa of the intestine. In three instances eggs and larvae were also present and in one there was destruction of the circular muscle coat. He believes that the worms were *A. braziliense*. Garin (p. 673) records a patient from whom 302 hookworms were removed, who showed no symptoms although some anaemia was present.

Landsberg (p. 279), from experiments in dogs infected with *A. caninum*, shows that there is a progressive increase in reticulocytes corresponding with the progressive decrease in erythrocytes and haemoglobin, without any evidence of haemolysis. This was also found in normal dogs subjected to successive bleedings and the results do not support the theory that inhibition of bone marrow activity through toxic action takes place, but rather that hookworm anaemia is the result of blood loss. A reduced platelet count is one of the known changes in anaemia due to some poisoning of the bone marrow. No such change was found by Landsberg (p. 673) even in fatal *A. caninum* infection of dogs, and this provides further evidence against the view that hookworm anaemia is produced by a toxin. Clotting power was not reduced. Ryo (p. 278) emphasizes his opinion that hookworm anaemia is due to the continuous blood loss. In experiments on man with *A. duodenale* he found that the time from infection to oviposition was from 54 to 57 days. Eosinophilia became obvious a week after infection, was at its height in 6 to 7 weeks, but decreased after the 15th week. The numerical relationship between the number of worms and the intensity of the anaemia is not recognizable when the worms harboured are less than 50. The blood loss caused by one *A. caninum*, experimentally measured, varies enormously with temperature, the most favourable being 38°C. to 39°C.; and is about 0·38 cc. per diem, but this may be multiplied 4 or 5 times if the worms are very vigorous.

Investigating the oedema of helminthic anaemia, SALAH (p. 673) found that in 12 of 22 cases there was hypoproteinaemia and 4 others responded to a high protein diet. He therefore suggests that replacement of blood deficiencies is a useful therapeutic measure. SILVEIRA and DE MOURA CAMPOS (p. 280) give results of estimations of gaseous interchange in the blood in hookworm anaemia. These cannot be further abstracted.

In the *Lancet* (p. 671) it is shown that the use of a poor diagnostic technique will give a high and false rate of cure ; that floatation gives higher counts than dilution ; but that D.C.F. is the most accurate method in that it can detect a single normally ovipositing female hookworm and that detection of worms, not egg counts, must be the basis for evaluating drugs. PESSÔA and PASCALE (p. 275) found that examination by the Stoll-Hausheer technique detected no relationship between egg counts and hookworms recovered after treatment, and that this method cannot be relied upon to detect light infections. PESSÔA (p. 674) examines the findings in consecutive stools following treatment and confirms the opinion of MAPLESTONE and MUKERJI that examination of stools for worms for one day only does not give a true picture of the numbers present.

HABERT (p. 392) records two patients who developed symptoms suggestive of yellow fever after taking 3 cc. carbon tetrachloride, and a third who died with hepatitis of the yellow fever type after taking a dose of the drug [quantity not stated]. D'ANELLA and TOURENC (p. 675) report two deaths from carbon tetrachloride poisoning, which are attributed to the presence of phosgene. PEU-DUVALLON (p. 676) advises Didakol, or carbon tetrachloride with chenopodium and chloroform, in treatment, and ERHARDT (p. 676) experimented on cats infected with *A. caninum* by giving various drugs, including carbon tetrachloride in doses equivalent to almost 1 oz. for a man. Commenting on these papers LANE points out that no evidence was produced in the first to show that phosgene was the cause of death, and that carbon tetrachloride itself can be lethal in doses ordinarily given ; that in the second a large dose (4 gm.) of carbon tetrachloride is mixed with 1·5 gm. chloroform, the action of which is similar ; and that in the third the experiments do not apply to man since the large doses killed some of the experimental animals. He makes a plea for a large scale enquiry into the safety and efficiency of anthelmintics.

MAPLESTONE and MUKERJI (p. 282) give details of 96 persons treated for hookworm infection by 3 cc. of tetrachlorethylene and 1 cc. oil of chenopodium ; and of 90 treated with 4 cc. of tetrachlorethylene. Percentages of real and "practical cures" with the former were 65·6 and 84·4 after two treatments ; with the latter 77·7 and 94·4 after three treatments. Faecal examination was carried out by D.C.F. PESSÔA and PASCALE (p. 281) claim that a dose of 4 cc. of tetrachlorethylene in gelatin capsules eliminates about 95 per cent. of Necator. Details of 51 persons treated are given and the results are calculated on findings by the Willis technique. LANE comments that the validity of the conclusions rests on the assumption that the technique is accurate.

SORONDO CAMPANERÍA (p. 272) discusses oil of chenopodium. VAN WYMEERSCH (p. 676) uses Entelmintina, a preparation of male fern, for ankylostomiasis.

CHAVES (p. 674) discussing the value of shoes in the prevention of hookworm infection points out that as children tend to wear them in

the uncontaminated environment of schools and to discard them in the home environment where contamination is likely, comprehensive measures including medication and the use of sanitary latrines are necessary. Shoes have only auxiliary usefulness. COCKELL (p. 280) shows how ankylostomiasis has decreased in Fiji following the installation of standard borehole latrines with concrete squatting slabs. Details of the latrines are given. A campaign of education was also conducted.

CHANDLER (p. 380) shows that more larvae of Nippostrongylus introduced into already infected rats fail to establish themselves in the intestine, than in normal controls, but that there is no evidence of increased retention in skin previously exposed to penetration, although leucocytic infiltration and eosinophilia are increased. Immunization and skin reaction as a result of infection with *A. caninum* are specific. Attempts at passive immunization with serum from rats infected with Nippostrongylus produced little result.

Strongyloides Infection.—OSBURN (p. 678) reports 5 cases of *Strongyloides stercoralis* infection. Two showed diarrhoea and severe anaemia probably entirely caused by the infection. SNOEK (p. 677) successfully treated 2 cases infected with *S. stercoralis* with intravenous tartar emetic and gentian violet *per os*.

Ascaris Infection.—KELLER *et al.* (p. 669) show that the incidence of Ascaris infection in North Carolina has risen since 1921. The average worm burden in each infected person increases in proportion to the number of infected persons in each family. WINFIELD and YAO (p. 271) examined washings from 274·5 kilograms of vegetables in China for Ascaris eggs without finding any, though eggs were found in the soil of vegetable gardens in 57·1 per cent. of 49 samples. They therefore conclude that the contamination of vegetables is not a major source of infection.

SARGENT (p. 272) records the case of a boy in whom a mass of worms in the right iliac fossa caused acute intestinal obstruction which was relieved by enemata. Oil of chenopodium followed by santonin brought away 87 worms. Intestinal obstruction was caused by Ascaris in the small intestine in 4 children reported by CIPRIANO (p. 670). Operations were performed and 2 of the children died, 1 of whom had in addition volvulus of the intestine.

BROWN (p. 273) considers that anthelmintics are absorbed through the body wall of Ascaris and in this manner rather than by ingestion produce their effect. Delayed death of the worm results from injury of a small portion by the application of an anthelmintic locally.

Filariasis.—TANAKA (p. 389) reports that there is much infection with *W. bancrofti* on Boko Island.

O'CONNOR and BEATTY (p. 761) in St. Croix found 25·08 per cent. of wild *Culex fatigans* showing infection with larval forms of *W. bancrofti*. Only 2·3 per cent. showed the infective stage and of those infected the figure of infectivity was 9·1. Infection was highest in July. Larvae in 49 per cent. of *Aëdes aegypti* which were found to be infected did not reach infectivity, but development proceeded to infectivity in *Anopheles albimanus* and *C. habilitator* ; these mosquitoes, however, are rare. For 24 hours after a feed microfilariae and their sheaths are passed by mosquitoes *per anum*. The effective proportion of infective mosquitoes is probably, for various reasons, much less than these figures suggest. Measures for reducing human infection are suggested. BRUG (p. 760) in Kabaena differentiates between " crude "

and "corrected" infection indexes in vectors of *Mf. bancrofti*. From the latter category are excluded mosquitoes containing only larvae with very retarded development which if included might give a false impression of their suitability as vectors. Complete development was found in *A. barbirostris*, *A. aconitus*, *C. fuscocephalus*, *C. whitmorei*, *C. fatigans*, *C. alis* and *vishnui* and *C. annulirostris*. Hu (p. 389) shows that *C. pipiens pallens* were more frequently and more heavily infected after feeding on a heavily infected patient than on one lightly infected, and when the feeding took place at a time when embryos were most numerous in the blood.

Abe (p. 389) studied the biological behaviour of freed larvae of *W. bancrofti* which had undergone full development in *C. fatigans*. The larvae lived longest, 37 to 58 hours, when placed in normal saline, but were extremely sensitive to drying.

Montestruc and Bertrand (p. 390) report two cases of lymphangitis, in one of which streptococci and *Mf. bancrofti* were found in an abscess. Gorter (p. 391) gives details of the operative treatment of elephantiasis of the legs, the results of which have been gratifying and which has ensured a satisfactory lymph flow. For full information the original abstract must be consulted. de Greef (p. 762) discusses the results of operative treatment of elephantiasis. He considers that in the Congo onchocerciasis may be accompanied by elephantiasis, but, as Lane points out, does not mention the possibility of mixed infection without microfilariae in the blood.

Dassanayake (p. 759) reports on an endemic area in Ceylon in which *Mf. malayi* is the only filarial larva present. Circumscribed foci are present in villages situated near water tanks containing Pistia plants or having many naturally infected Mansonia. Galliard (p. 387) states that although recent investigations in Tonking have shown a higher percentage of microfilariae than were found in 1911, the difference is probably due to the larger amount of blood examined in the later investigations. He also (p. 388) reports that in Tonking *Mf. malayi* is about twice as common as *Mf. bancrofti*, but that considerable local variations occur. *W. bancrofti* was always the only cause of urogenital lesions, but *Mf. malayi* was present in 20 per cent. of cases of elephantiasis of the legs. Liu (p. 388) found *Mf. malayi* in 2 of 80 persons examined in Changsha, Hunan. Hu *et al* (p. 387) report the finding of *Mf. malayi* as well as *Mf. bancrofti* in examinations in Foochow where the former had not previously been seen. Five of fifteen *C. fatigans* caught in one house were infected. In Borneo Kariadi (p. 760) found the highest index of infection in *Mansonia annulifera* (22 per cent.), a domestic mosquito. *M. uniformis* and *A. barbirostris* are also infected and parasite indexes as high as 32·2 per cent. were found in men in the district examined.

Sweet and Pillai (p. 766) report on the success of the clearing of Pistia in lessening the incidence of Mansonioides in North Travancore, which illustrates the suppression of a mosquito-borne disease by a strictly limited species control of the carrier.

Lane (p. 764) discussing filarial periodicity makes a suggestion that charts of microfilaria which would be found if a series of dogs were infected with Dirofilaria and if the blood were examined every two hours, should be correlated with the number of empty worms to be found in the hearts of the dogs after they had been killed at different hours. In a discussion of the same subject Hinman (p. 385) considers that the theory of simultaneously timed parturition can only be accepted

if the female worms are shown to be capable of producing enough embryos daily to account for the enormous numbers frequently seen and if a comparable destruction of microfilariae occur about midnight. There is no evidence on the second point, but on the first he has found in dogs infected with *Dirofilaria immitis* that there is no correlation between the number of worms and the larvae found, the variation being between 10,740 and 3,750,945 per female worm. He cannot conceive it possible that single worms can produce daily the large numbers indicated. He cites an experiment by KNOTT from which it was concluded that embryos can survive in man up to 2 weeks following blood transfusion, but LANE criticizes this on the grounds that it was not certainly known that the human volunteer in that experiment had not previously harboured infection unknown to the investigator. HINMAN shows that fertilized female Dirofilaria in saline or Ringer solution at 39°C. produced the greatest numbers of microfilariae within 6 to 12 hours of introduction into the media irrespective of whether the animal was killed at 7 a.m. or 7 p.m., and that the usual number produced was from 4,000 to 10,000 per worm. Admitting the insufficiencies of this experiment the author considers that if cyclical parturition were the rule in the normal habitat there should have been some indication of it under these experimental conditions. In comment LANE sets out his view that periodicity is due to simultaneous parturition, and that microfilariae in the blood are short lived owing to the action of the reticulo-endothelial cells.

JOYEUX and SAUTET (p. 390) have grown *Mf. immitis* in a mixture of serum and haemolysed blood from an infected dog. The average period of survival was 12 days, and an increase in length of the embryos to 280–442 μ was observed in the first 6 days when measured without being fixed. LANE considers that the absence of such large forms in the blood may be presumptive evidence of rapid destruction in the body. O'CONNOR and BEATTY (p. 765) examined the reaction of birds infected with *Vagrifilaria columbigallinae*. No periodicity was seen in the microfilariae present in the blood. In the livers large aggregations of lymphocytes and giant cells were seen surrounding embryos in all stages of degeneration and the whole picture suggested massive death, degeneration and absorption going on continuously in the organ. LANE points out the importance of this observation in relation to human filariasis.

DE CHOISY (p. 762) reports apparent success in the treatment of Loa infections with anthiomaline injected on alternate days. RISHWORTH (p. 763) reports a patient from beneath whose conjunctiva a female worm was removed. A second female was found under the skin of the neck. No microfilariae were found in the blood. MAPLESTONE (p. 763) examined the worms and regards them as probably belonging to a new species of the genus Loa. He suggests the tentative name of *L. inquirenda*, but the matter cannot be fully elucidated until a male is found.

STRONG (p. 767) considers that in onchocerciasis the nodules do not represent the place which the flies have bitten but are probably found where lymphatics converge or where pressure impedes the free flow of lymph. He discusses the question of infection without nodules, but SANDGROUND (p. 768) always found a nodule when microfilariae had been discovered in the skin or conjunctiva, though sometimes only after assiduous search. Single nodules may be compounded of several

small ones each with separately walled off worms. He believes that *O. volvulus* is a parasite of cattle and eland as well as of man.

Adams (p. 769) reports a man with eosinophilia of 33 per cent. without microfilariae in the blood but with 9 *Mf. volvulus* in an excised piece of bulbar conjunctiva, and others in 3 of 48 skin snips. They were also seen within the eye on slit lamp examination. Symptoms were delayed probably 3 to 5 years after infection.

Hissette (p. 768) notes that in the eye inflammatory exudate may be present where there are no larvae and larvae may exist without obvious lesions. There is a slight and slow reaction to living larvae and a clear appreciable reaction to dead ones. The pupil is typically oval or pyriform; there may be punctate keratitis, vascular keratitis and choroido-retinitis ending in optic atrophy which is the cause of the blindness which ensues. Marbaix and Appelmans (p. 767) describe the histological appearances of a piece of conjunctiva infected with Onchocerca. Infiltration of the connective tissue with large reticulo-endothelial cells, lymphocytes, polymorphonuclears and eosinophils; nodules with necrotic centres and giant cells; and microfilariae surrounded by more or less cellular infiltration were found. Diagnosis must rest on the finding of microfilariae. Adams (p. 769) states that treatment consists of the removal of adult worms, which are not affected by any known drug, though larvae may be killed with temporary improvement of symptoms by antimony and plasmoquine. Lane (p. 765) considers that certain arsenicals sterilize but do not kill the mother worms. This could be tested in a patient with onchocerca nodules by excising a nodule, giving the drug treatment, and then excising a second nodule and comparing the condition of the females in the two.

Moorthy (p. 769) discusses the development of *Dracunculus medinensis* in cyclops and describes abnormal forms, the illustrated abstract cannot be further summarized. Trewn (p. 391) remarks on the importance of the "step well" in the causation of guineaworm infection, on the presence of 56 worms in one person at the same time, on the immunity to infection shown by certain people, and on the value of injecting into the worm itself 1 in 1,000 corrosive sublimate and using a dressing of the same solution. Gore (p. 772) uses ichthyol as a compress for inflamed skin over guineaworms. Moorthy and Sweet (p. 771) in dogs infected with *D. medinensis* found adult worms in chamber of the left ventricle of the heart, in the meninges and more commonly in the subscapular and retroesophageal areas and elsewhere. Epileptic symptoms may possibly be caused in man by meningeal infection. They consider that copulation takes place in the tissues and not in the intestine, and that male worms after fertilizing the females die and are absorbed. The same may be true of unfertilized or even fertilized females. Calcification is rare.

Trichuris and Enterobius Infections.—Desportes (p. 678) reports 52·4 per cent. and 9·06 per cent. infections with Trichuris and Enterobius in caeca and appendices preserved by Brumpt from post mortems carried out in Paris in 1909.

Dinnik and Dinnik (p. 678) investigated the factors of temperature, absence of oxygen and drying on the eggs of Trichuris. Dried eggs survive for a long time.

Vazquez Pausa (p. 380) found that Trichuris infestation was cured in 95 per cent. by doses of 4 to 5 gm. Ferri et Ammon. Cit. daily, which also benefits the associated anaemia. Maplestone and Mukerji

(p. 282) consider that tetrachlorethylene is probably unsatisfactory in Trichuris infection but gives 90 per cent. of cures in Enterobius infestation. WRIGHT *et al.* (p. 381) also advocate tetrachlorethylene in doses of 0·1 cc. for each year of age as a single-dose treatment for Enterobius infection. They use magnesium citrate as the purgative administered at the same time.

WRIGHT and CRAM (p. 678) show that Enterobius infection is often familial, and that eggs are found on clothing, furniture, etc. Tetrachlorethylene is perhaps the most efficient anthelmintic for single-dose treatment, but there is need for a cheap, effective and safe anthelmintic.

CRAM *et al.* (p. 382) by the use of the Cellophane N.I.H. swab found a high proportion of persons harbouring Enterobius in Washington. Repeated examinations may be necessary but the swab method is better in diagnosis than the examination of faeces for eggs.

Trichinella Infections.—SCHEIFLEY (p. 679) estimates the incidence of Trichinella infection in man in the U.S.A. as about 20 per cent. Neither the pressed muscle nor the gastric digestion methods are capable of detecting all infections. This heavy infestation rate was not suspected during life, and the incidence in swine must be high, possibly 2 to 4 per cent. VAN SOMEREN (p. 679) observed that gastric digestion of the wall of trichinella cysts allows the escape of a jelly-like substance. The larva then becomes active and passes tail first through the opening made by digestion.

NICOLESCO *et al.* (p. 382) advise the examination of the sediment from blood laked with acetic acid and centrifuged, for the diagnosis, by discovery of larvae, of early Trichinella infection. SAWITZ (p. 383) compares the results of skin testing with Trichinella antigen and of post mortem findings. Five per cent. of 200 in each series gave evidence of infection, and the sex and age incidences were similar. No negroes reacted to the test, but this may be due to the difficulty of reading it in a dark skin.

JOSES and WELLS (p. 384) describe the symptoms of Trichinella infection: puffiness of the eyelids, tenderness of muscles and eosinophilia with positive precipitin reaction and skin test. WANTLAND (p. 384) shows that polycythaemia and increase in the percentage of haemoglobin occurred in 7 of 12 rabbits infected with *Trichinella spiralis* and that hypereosinophilia was associated with marked symptoms. Increase in clotting time and erythrocytic macrocytosis were observed.

PIERCE and MCNAUGHT (p. 384) show that alcohol interferes with the liberation of larvae of Trichinella by gastric digestion, but that sufficient concentrations in the human stomach are not maintained for the long periods necessary to kill them.

Gnathostoma Infections, etc.—AFRICA *et al.* (p. 773) consider that *G. spinigerum* requires a fresh water fish as a second intermediate host. They regard certain snakes as "unsuitable" hosts in which development to a certain stage only is possible. Suitable and unsuitable hosts are probably infected not by drinking water containing infected cyclops but by eating fresh water fish which in turn have eaten cyclops. MAPLESTONE and BHADURI (p. 772) describe a case of infection with Gnathostoma and point out that the swellings even though widely separated usually cease on the removal of a single worm. Swelling of the pharynx with dyspnoea were seen in half of 25 cases analysed.

Kofoid *et al.* (p. 392) failed to effect transmission of *Thelazia californiensis* by means of cockroaches and by injection or instillation of larvae into the conjunctival sac of dogs. *C. Wilcocks.*

HELMINTHIASIS.

Précis of Abstracts in this Section.

Coutelen (p. 715) describes granules in the laminated cuticular layer of hydatids which stain with silver and are probably produced by cells of the germinal layer.

Discussing the diagnosis of *Echinococcus alveolaris*, Bühler and v. Hasselbach (p. 715) show that only histological examination can be accurate, but a tumour of the liver, unassociated with any other growth, deep jaundice with comparatively slight subjective disturbance, X-ray evidence of calcification and a long history should suggest the correct diagnosis.

Chung and T'ung (p. 715) found that both hydatid and cysticercus cyst fluid gave strongly positive skin reactions in patients with echinococcosis, cysticercosis or intestinal taeniasis. The complement fixation test with hydatid cyst fluid may be used to detect cysticercosis in man, but since the undiluted fluid may give false positive reactions with syphilitic or other sera, a dilution of 1 : 4 should be used. These tests are therefore group immunological reactions rather than specific reactions for hydatid disease alone. Sergent *et al.* (p. 716) on the other hand consider that a positive result to a *first* intradermal injection of hydatid fluid is definite evidence of the presence of hydatid, but that repetition of the test in a negative reactor may lead eventually to a positive result in the absence of hydatid disease through activation by the earlier injections.

Sawitz (p. 716) reports the finding of a hydatid cyst in the liver of a man in Louisiana who died with a clinical picture of cirrhosis with ascites. Gómez López and Luna (p. 716) describe a case of hydatid cyst of the base of the lung in Venezuela, the first to be confirmed there. Of 7 hydatid cysts treated by Moisesco *et al.* (p. 717) 4 were in the lung and 3 in the liver. One of the latter simulated lithiasis, with jaundice, vomiting and pain.

Meijer (p. 717) states that *Diphyllobothrium erinacei* (synonyms *D. mansoni* or *D. raillieti*) is present in the Dutch East Indies. The plerocercoid is found in frogs, rats, swine and shrews.

Hiyeda and Terada (p. 717) use Raigan, a sort of mushroom (*Omphalia lapidescens*) for Taenia infection. The dose is 20 grains of the powdered plant or 0·4 grains of the active principle. It acts apparently by destroying the tissues of the worms and was successful, without ill effects, in over 100 cases treated.

Seventeen cases of infection with *Cysticercus cellulosae* are reported by Hanasaki (p. 718) and of these 6 showed evidence of infection by adult worms. A massive infection with cysticercus was revealed by

X-ray in a man of 66 reported by BRETON and LAVIER (p. 718). There was general muscular atrophy and the cysts were most frequent in the muscles about the pelvis, back and pectoral region. Remarkable athletic powers were shown by and remained unimpaired in the patient recorded by EVANS (p. 719) in whom several hundred cysts were found by X-ray in the thigh, thorax, arm and neck. AUSTONI (p. 719) describes a case of cysticercosis in a girl of 10 years, who died of the infection. ALBERT (p. 719) records a large cysticercus of the liver with abscess and subsequent peritonitis. The patient described by SEGAL (p. 719) had a cysticercus infection of the right iliac bone with sequestrum formation, which was diagnosed radiologically as chronic osteomyelitis.

ROMAN (p. 720) infected a white mouse by administering onchospheres of *H. nana*.

KOURÍ and DOVAL (p. 720) report infection of 3 children with Davainea (species not stated). One suffered from asthma and anaemia; male fern and carbon tetrachloride expelled the worm.

LEÓN (p. 720) describes the characters of *Raillietina quitensis* León, of which the definitive host is man and the intermediate host unknown.

BEARUP and MORGAN (p. 721) report 3 human infections with *H. diminuta* and 2 with *D. caninum* in Australia.

PETROV (p. 721) records the finding of *Diphyllobothrium skrjabini*, (normally a parasite of dogs) in man, and of a new species *D. nenzi*.

LANE (p. 721) emphasizes the four essentials for successful diagnosis of Ascaris and Trichuris infections by D.C.F.: the presence of fertile eggs, the proper disintegration of faeces, the use of a vessel large enough to prevent over-concentration and a floating fluid whose *ascertained* specific gravity is just over 1,200. If these are fulfilled the collection of Ascaris eggs by D.C.F. is 4 to 6 times greater than by the Willis technique and the results are much more constant. Salt solution three-quarters saturated, which is the optimum for hookworm eggs, is not heavy enough for Ascaris and Trichuris. He mentions air-borne infection and the breeding of cockroaches (possible carriers of Ascaris eggs) in borehole latrines.

YOSHIDA and TOYODA (p. 722) give results of the hatching of Ascaris eggs in various media.

PIRES (p. 722) records asphyxia due to Ascaris in the trachea, a large ileo-caecal swelling due to masses of Ascaris and a hypogastric abscess containing a decomposing worm. FLAMINI (p. 723) describes a case of appendicitis due to Ascaris. CAIADO (p. 723) describes a case of intestinal obstruction due to Ascaris, but only 12 were expelled after an anthelmintic. LECERCLE (p. 723) ascribes a case of acute haemorrhagic pancreatitis to an Ascaris in the bile ducts near the duct of Wirsung. CHANCO (p. 723) extracted an Ascaris from the umbilicus of a child.

VANNI (p. 724) produced severe haemorrhagic allergic reactions in sensitized rabbits by the injection of coelomic fluid of *Parascaris equorum*. In line with experimental results, certain symptoms (urticaria, convulsions and asthma) in man are attributed to allergy to the body fluid of the worms. MACHEBOEUF and MANDOUL (p. 724) show that the toxic substance contained in the coelomic fluid and tissues of *Ascaris megalocephala* can kill a guineapig in a few minutes if given intravenously. It is not precipitated by trichloracetic acid and will not pass through a collodion membrane. *Moniezia expansa* has no such toxic substance. *C. W.*

Starkoff (O.). La preparazione dei platelminti col metodo di Dammin. [**Mounting of Platyhelminths by Dammin's Method.**]—*Ann. d'Igiene.* 1938. Sept.–Oct. Vol. 48. No. 9–10. pp. 609–611. With 2 figs.

A recommendation for Italian readers of Dammin's method (this *Bulletin*, 1938, Vol. 35, p. 602) for the permanent mounting of platyhelminths. *Clayton Lane.*

Coutelen (F.). Sur la structure et sur la morphogenèse de la membrane cuticulaire des hydatides échinococciques. [**The Structure and Morphogenesis of the Cuticular Membrane of Hydatids.**]—*C. R. Soc. Biol.* 1938. Vol. 129. No. 25. pp. 149–151.

The laminated cuticular layer of a hydatid contains granules which stain with silver and are probably put out in successive bursts by specialized or by all cells of the germinal layer. The granules break up into finer ones, and those zones which lie between the lamellae of the membrane are probably those in which the granules were originally densest. *C. L.*

Bühler (F.) & v. Hasselbach (H.). Zur Diagnostik des *Echinococcus alveolaris.* [**Diagnosis of** *Echinococcus alveolaris.*]—*Muench. Med. Woch.* 1938. Oct. 28. Vol. 85. No. 43. pp. 1665–1668.

An experience of four cases of alveolar hydatid of the liver leads to these suggestions for help in a difficult diagnostic problem.

In a dweller in the Alps with this infection there will be found some of these conditions. A tumour of the liver with no evidence of another to which it could be secondary. Deep jaundice with comparatively slight subjective troubles, good appetite, no cachexia, eosinophilia, an X-ray plate shows calcification, and there is an unusually long history. In this way an explanatory laparotomy will not leave the condition labelled as cancer of the liver with undiscovered primary focus. Only histological examination can give a right diagnosis. *C. L.*

Chung (Huei-Lan) & T'ung (Tsun). **The Non-Specificity of the So-called Specific Biological Tests for Hydatid Disease.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1939. Apr. 6. Vol. 32. No. 6. pp. 697–706. [11 refs.]

"The Ghedini-Weinberg's complement fixation reaction and the Casoni's intradermal reaction are group immunological reactions to somatic cestode infections rather than specific reactions for hydatid disease alone. Both hydatid cyst fluid and cysticercus cyst fluid gave a strongly positive complement fixation reaction with blood of either echinococcosis patients or cysticercosis patients. Both hydatid cyst fluid and cysticercus cyst fluid gave a strongly positive cutaneous reaction on patients with either echinococcosis, or cysticercosis, or intestinal taeniasis. The cerebrospinal fluid as well as the blood of most of the patients with cerebral cysticercosis gave a strongly positive complement fixation reaction. The serum of rats infected with *Cysticercus fasciolaris* gave a weakly positive complement fixation reaction with hydatid cyst fluid. The serum of four out of nine kala-azar patients gave a positive complement fixation reaction with hydatid cyst fluid of a 1 : 8 dilution. This positive reaction may be related to the high globulin content of the blood of kala-azar patients. Extracts of different tapeworms are not satisfactory antigens for the

detection of somatic cestode infections because of their anti-complementary nature. The complement fixation test with hydatid cyst fluid as antigen may be utilized to detect cysticercosis in man (and possibly also in pigs and cows). Only the diluted hydatid cyst fluid (1 : 4 dilution) may be used as antigen for the complement fixation test for echinococcosis or cysticercosis, as the undiluted fluid very frequently gives a false positive reaction with the sera of patients with syphilis or other conditions. Whenever both the Ghedini-Weinberg's complement fixation reaction and the Casoni's intradermal reaction are positive, a differential diagnosis of somatic cestode infection and possibly also kala-azar must be considered unless the clinical picture is clear-cut."

SERGENT (Emile), FOURESTIER (Max) & GALLIANO (E. Jimenez). Le virage de la réaction de Casoni après une deuxième ou plusieurs intra-dermoréactions. [**The Activation of the Casoni Reaction after one or more Previous Intradermal Injections.**]—*Bull. Acad. Méd.* 1939. Feb. 7. 103rd Year. 3rd Ser. Vol. 121. No. 5. pp. 180–182.

This paper and its discussion were summed up by Sergent in the statement that if the intradermal reaction of Casoni, in answer to hydatid fluid with no antiseptic in it, is positive on the first test a hydatid is certainly present.

On the other hand there are given instances where, dissatisfied with a negative reaction to the first test, it has been repeated once or twice with a final positive result and yet autopsy or operation have shown that the tumour has been a cancer, the patient having been sensitized by the earlier injection. *C. L.*

SAWITZ (Willi). **Echinococcus Infection in Louisiana.**—*Jl. Parasitology.* 1938. Oct. Vol. 24. No. 5. pp. 437–439.

A man of 72, who came to New Orleans when 8 years old and had not since left it, died with a clinical picture of liver cirrhosis with ascites. Autopsy showed a small nodular fibrous liver with a cyst 4 cm. in diameter lined by a laminated chitinoid membrane. His work had been to feed and care for, at a railway depot, animals sent by express. His family had never kept a pet dog. Two cases are noted in which *Echinococcus granulosus* was found by others in dogs in Louisiana, but the presence of cysts in sheep, cattle and hogs is commonly reported. *C. L.*

i. GÓMEZ LÓPEZ (Luis) & LUNA (Guillermo). Un caso de quiste hidatidico del pulmón. [**A Hydatid Cyst of the Lung.**]—*Gac. Med. de Caracas.* 1938. July 15. Vol. 45. No. 13. pp. 193–194. With 2 figs.

ii. RÍSQUEZ (Rafael). Quiste hidatidico en Venezuela. [**Hydatid Cyst in Venezuela.**]—*Ibid.* pp. 195–197. [12 refs.]

i. This girl of 21 came under observation in a tuberculosis dispensary. Her general condition was good and her only trouble was headache. The sputum was free from tubercle bacilli, but there was an X-ray shadow at the base of the right lung. The Kahn reaction was slightly positive. It became negative after three months of intensive anti-syphilitic treatment, but the character of the shadow was unchanged though in 5 months time it was bigger. An eosinophilia of 6 per cent., in the absence of facilities for complement fixation or intradermal reaction justified puncture, and this produced a fluid free

from albumin, rich in chlorides and with many hydatid scolices. In discussion Risquez held that this is the first case in Venezuela confirmed by laboratory methods.

ii. The author goes into the history of earlier locally reported cases, but concludes that they are not convincing. *C. L.*

Moisesco (Th.), Paidiu (V.) & Dumitresco (D.). Contributions à l'étude clinique du kyste hydatique chez l'homme. Observations personnelles. [**Clinical Study of Hydatid in Man.**]—*Bull. Acad. Méd. Roumanie.* 1938. 3rd Year. Vol. 6. No. 5. pp. 671–682. With 6 figs. [17 refs.]

Of the 7 hydatid cysts which the authors have had under treatment, 4 have been in the lung with 1 suppurating, and 3 have been in the liver with 1 suppurating and with another simulating lithiasis by virtue of jaundice, vomiting and pain in the right hypochondrium.

C. L.

Mollow (W.). Echinokokkenkrankheit. [**Disease due to** *Echinococcus.*]—*Deut. Med. Woch.* 1939. Feb. 24. Vol. 65. No. 8. pp. 293–296.

Ivanissevich (Oscar), Ferrari (Roberto C.) & Rivas (Carlos I.). Equinococosis hidatídica del pulmón. [**Pulmonary Hydatid.**]—*Bol. Inst. Clin. Quirúrg.* Buenos Aires. 1938. Sept. Vol. 14. No. 119. pp. 1153–1182. With 26 figs.

Ivanissevich (Oscar), Piñero (Tomás A.), Risolía (Atilio A.) & Rivas (Carlos I.). Secuelas cavitarias de los quistes hidatídicos del pulmón. [**Cavities following Pulmonary Hydatids.**]—*Bol. Inst. Clin. Quirúrg.* Buenos Aires. 1938. Sept. Vol. 14. No. 119. pp. 1230–1234. With 3 figs.

Litarczek (Stella) & Chisar. Kyste hydatique primitif du poumon à évolution latente (polymorphisme des manifestations cliniques à l'époque des complications. [**Latent Primary Hydatid of the Lung ; its Polymorphism when Patent.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Bucarest.* 1938. Oct. Vol. 20. No. 8. pp. 201–205.

Meijer (W. C. Ph.). Over een lintworm van hond en kat, *Diphyllobothrium* (*Spirometra*) *erinacei* (Rudolphi, 1819) en het bijbehoorende plerocercoid. [*D.* (*S.*) *erinacei*, **Tapeworm of Dog and Cat and its Plerocercoid.**]—*Nederl. Indische Bladen v. Diergeneesk.* 1937. Dec. Vol. 49. No. 5 & 6. pp. 370–380. With 1 fig. [12 refs.]

This tapeworm, for whose name *D. mansoni* and *D. raillieti* are synonyms, is present or frequent in different parts of the Dutch East Indies where the presence of *D. latum* has not certainly been established. Its plerocercoid is found in frogs, rats, swine and in *Crocidura* species (insectivores—the shrews). *C. L.*

Hiyeda (Kentaro) & Terada (Bunjiro). **A New Anthelmintic "Raigan" for Taeniasis.** [Research Notes.]—*Jl. Parasitology.* 1939. Apr. Vol. 25. No. 2. pp. 183–184.

"Raigan is a sort of mushroom (*Omphalia lapidescens*) which grows on sandy soil where bamboo trees are luxuriant. It is dried to the hardness of stone and sold in the market."

It was used successfully in man for *Taenia solium*, *T. saginata* and *Hymenolepis nana* and apparently for *H. diminuta* and in the dog apparently for *Dipylidium caninum*. In no case was the scolex found but the worms had not reappeared in four months. The drug is believed to destroy the tissues of the worm, for the young segments, evidently of the larger worms, come away in small yellowish-brown motionless pieces and the bigger ones sometimes in chains. The segments of Hymenolepis were rarely seen. The treatment at first was with 20 grains of powdered Raigan three times a day for 3 days, and a complete cure, it is claimed, was always obtained with no ill effects in over 100 cases, there being no preparatory treatment and no after purge.

"After we had succeeded in extracting the active principle from the crude material, we reduced the doses from 20 gr. to 0·4 gr. . . . The chemical nature of the active principle . . . has not yet been determined. We shall be glad to supply this drug to investigators in large amounts at cost or in small amounts gratis."

They write from Manchuria Medical College, Mukden, Manchoukuo. [See also this *Bulletin*, 1937, Vol. 34, p. 806.] *C. L.*

GANGOLLI (D. A.). **A Case of Tape-Worm simulating Acute Appendicitis.**—*Indian Med. Gaz.* 1938. Nov. Vol. 73. No. 11. p. 681.

HANASAKI (Tameyasu). Ueber *Cysticercus cellulosae hominis*. [*Cysticercus cellulosae* **in Man.**]—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1938. Oct. Vol. 37. No. 10 (403). [In Japanese pp. 1509–1522. With 2 figs. on 1 plate [34 refs.] German summary p. 1523.]

In the Okinawa prefecture 17 cases of infection with *C. cellulosae* have been seen in six years. Evidence of intestinal infection by the adult, displayed by eggs or segments, was found in 6 of the 17.

C. L.

BRETON (M.) & LAVIER (G.). Un cas de cysticercose musculaire généralisée decéle par la radiographie. [**A Case of Generalized Cysticercosis of Muscle revealed by X-Rays.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1938. Dec. 19. 54th Year. 3rd Ser. No. 34. pp. 1721–1725. With 1 fig.

X-rays, undertaken on suspicion of a latent prostatic neoplasm with vertebral metastases, disclosed a most massive infection of muscle by cysticerci.

The man of 66 was very weak with general muscular atrophy, a fairly thick adipose tissue covering, and no nodules palpable anywhere. Red cells 3,648,000, leucocytes 4,600, eosinophils 1 per cent. The X-ray shadows were most frequent in the muscles about the pelvis, the back and the pectoral region. The right leg was chosen for illustration because the shadows were discrete and their shape evident. The face probably showed two shadows. Excision of a nodule from the calf disclosed what was believed to be a calcified cysticercus. The infection has far from disappeared from France. *C. L.*

Evans (R. R.). **Cysticercosis in an Athlete.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1939. Jan. 28. Vol. 32. No. 4. pp. 549–550. With 2 plates.

As an athlete, this bandsman of 24 had played regularly for the band team in Association football and hockey, had recently been tried out for the Battalion Rugby team, and had represented the battalion in 120 yards hurdles, relay race and cross country running. He had had nodules removed and identified as cysticerci, but following this and a lumbar puncture he had an epileptic fit. In August 1937, he was admitted to hospital following a fit but, pleading to be allowed to leave it, he got second place for the long jump in the Highland Games at Crieff with a jump of 21ft. 5 in. He had never had a tapeworm or such symptoms of invasion as muscular pains, rheumatism, headache or fever. X-ray plates show in the upper two-thirds or so of one thigh, and in the thorax, arm and neck, several hundred cysts, and yet his athletic prowess seemed to be unimpaired. *C. L.*

Austoni (Mario). Su di un caso di cisticercosi generalizzata grave. [**Severe Generalized Cysticercosis.**]—*Policlinico.* Sez. Prat. 1939. Apr. 3. Vol. 46. No. 14. pp. 627–30, 633–6, 639–43. With 11 figs. [30 refs.]

A girl of 10 died of cysticercosis, it being estimated that there were 15,000 to 20,000 cysts, mostly in the muscles, few in the abdominal organs, and subpleurally in the lungs. During life submaxillary and dorsal swelling, exophthalmos, headache, vomiting, fits and weakness were marked. The infection is attributed to *Taenia solium*. The considerable list of literature while going back to 1860, has no mention of English literature and of the great advances reported by MacArthur and others. *C. L.*

Albert (Zygmunt). Ein grosser Zystizerkus der *Taenia solium* in der Leber. [**A Large Cysticercus of *Taenia solium* in the Liver.**]—*Zent. f. Bakt.* I. Abt. Orig. 1938. Oct. 17. Vol. 142. No. 7/8. pp. 374–376. [10 refs.]

In the liver of a 36-year-old woman was a large cysticercus with abscess and subsequent peritonitis. It was identified as such by appearance, and by the presence of an adult in the bowel. No trace of echinococcus was found in spite of careful search. *C. L.*

Segal (A.). **A Case of Cysticercosis of Bone.**—*South African Med. Jl.* 1938. Oct. 22. Vol. 12. No. 20. pp. 762–763.

A condition believed to be chronic osteomyelitis of the right iliac bone displayed itself after three years to be a cysticercus infection.

A swelling in the right buttock was after 10 months excised as a cyst but on operation the diagnosis was changed to a ganglion containing sterile pus and originating from a diseased right iliac bone, a diagnosis confirmed by X-rays, which displayed sequestra. These were removed, and sinuses eventually closed only to reopen shortly. It was then found repeatedly that when a needle was inserted into the swelling which was present it would withdraw a little fluid only, but if now put in in another direction more would come through it.

Finally it was drained of a large quantity of fluid, an intact grape-like cyst and several collapsed ones. PIJPER reported a typical cysticercus wall which, however, had no scolices. *C. L.*

SHIMOKAWA (Hachio) & INOUYE (Hisashi). Ein Fall von *Cysticercus cellulosae hominis*. [**A Case of** *Cysticercus cellulosae* **in Man.**]—*Taiwan Igakkai Zasshi (Jl. Med. Assoc. Formosa).* 1938. Oct. Vol. **37**. No. 10 (103). [In Japanese pp. 1524–1528. With 2 figs. [27 refs.] German summary p. 1529.]

GALLAIS (P.). Deux cas de cysticercose cérébrale avec manifestations épileptiques. [**Two Cases of Cerebral Cysticercosis with Epileptic Symptoms.**]—*Bull. Soc. Path. Exot.* 1938. Dec. 14. Vol. 31. No. 10. pp. 915–919.

ROMAN (E.). Sur l'infestation des rongeurs par l'*Hymenolepis nana* de l'homme. [**Infection of Rodents with** *H. nana* **from Man.**]—*Ann. Parasit. Humaine et Comparée.* 1939. Jan. 1. Vol. **17**. No. 1. pp. 12–16. With 1 fig. [14 refs.]

Of five white mice fed on onchospheres of *H. nana* passed by a French girl with diarrhoea, 1 was found infected when killed 4 days later. All the larvae were in the last quarter of the small intestine.

C. L.

KOURÍ (Pedro) & DOVAL (José Macho). Tres casos de parasitismo humano por especies de la familia Davaineidae. [**Davainea Species in Three Persons.**]—*Rev. Med. Trop. y Parasit.* Habana. 1938. July–Aug. Vol. 4. No. 4. pp. 207–217. With 7 plates. English summary.

A preliminary paper in which determination of the species is not made.

The parasites were found in three children from 18 months to 9 years old, the last being reported in detail. He had had a tapeworm for 6 years, and had suffered from an asthmatic condition, bronchitis, headache and weakness with anaemia (red cells 3·7 millions) and haemic mitral murmur. There were no eggs in the faeces but segments were passed. Treatment consisted of one of 12 capsules given every five minutes which in all contained 4 cc. of ethereal extract of male fern and 1 cc. of carbon tetrachloride, the worm being expelled after the seventh capsule. *C. L.*

LEÓN (Luis A.). Contribución al estudio de la parasitologia Sudamericana. El género Raillietina y su frecuencia en el Ecuador. [**On South American Parasites. Raillietina in Ecuador.**]—*Rev. Med. Trop. y Parasit.* Habana. 1938. July–Aug. Vol. 4. No. 4. pp. 219–230. With 9 figs. on 5 plates.

León reports the detection in Ecuador of nine infections of man by *Raillietina quitensis* León, 1935.

The list of references does not include that in which he named the tapeworm. It is described as 10 to 12 metres long and 3 mm. broad with retractile rostrum and 2 rows of hooks, suckers ovoid and averaging about 1 mm. across, with a surrounding row of persisting hooks. There are about 5,000 segments, at first wider than long, then square and about 3 mm. across; the terminal segments have 200 to 250 egg

capsules; genital pores unilateral, onchospheres oval with very long hooks; definitive host man, intermediate host unknown, found in Ecuador. It has caused abdominal pain, nausea, diarrhoea, weakness, headache, vertigo, and mental dullness. *C. L.*

Bearup (A. J.) & Morgan (E. L.). **The Occurrence of *Hymenolepis diminuta* (Rudolphi, 1819) and *Dipylidium caninum* (Linnaeus, 1758) as Parasites of Man in Australia.**—*Med. Jl. Australia.* 1939. Jan. 21. 26th Year. Vol. 1. No. 3. pp. 104–106. [27 refs.]

Having noted that, in the Australian hookworm campaign under Sweet from 1919 to 1924 which examined 202,582 persons, *Hymenolepis nana* was found in 0·2 per cent. and *Taenia solium* or *T. saginata* in 0·02 per cent., there are reported three human infections with *H. diminuta*; and two with *Dipylidium caninum*, all in children. The two latter are believed to be the first recorded from the continent. *C. L.*

Liddo (Salvatore). "Hymenolepis diminuta" nella provincia di Bari. [*H. diminuta* **in Bari Province, Italy.**]—*Pathologica.* 1938. Oct. 15. Vol. 30. No. 564. pp. 436–437. [11 refs.] English summary (5 lines).

There were found, in the faeces of a person 20 years old, the onchospheres of *Hymenolepis diminuta*, eggs of *T. trichiura*, a lamblia, a bodo, *E. coli* and *Blastocystis hominis*. References are given to the 12 Italian cases. *C. L.*

Petrov (M. I.). **New Diphyllobothriides of Man.**—*Med. Parasit. & Parasitic Dis.* Moscow. 1938. Vol. 7. No. 3. [In Russian pp. 406–413. With 10 figs. English summary p. 414.]

"The author describes two species of diphyllobothriides, found by the 113th All-Union Helminthological Expedition of the Institute of Tropical Medicine during medical treatment of the inhabitants of the Nentsi national district, of the Northern region. One of the species, *Diphyllobothrium skrjabini*, had been described by Plotnikov as living in dogs, and was for the first time found by the author in man. The second species, *Diphyllobothrium nenzi*, is a new species."

Lane (Clayton). **Points in the Diagnosis and Prevention of Ascaris Infection.**—*New Zealand Med. Jl.* 1939. Feb. Vol. 38. No. 203. pp. 23–26.

A restatement of points, deemed important but too little known, is made concerning the diagnosis and prevention of Ascaris infection.

As to diagnosis, this section is essentially a comment on a statement by Dempster [this *Bulletin*, 1939, Vol. 36, p. 320] "All authorities are agreed that the Willis technique is more accurate [than D.C.F.] in demonstrating ova of Ascaris and Trichuris." Uncertain as to what constitutes an "authority" Lane, writing as a worker, points out that to be soundly based comparative tests of diagnostic technique must rely on counts of the eggs which each recovers from the same evened material, and that there are four essentials for successful diagnosis of Ascaris and Trichuris infections by D.C.F., namely—the presence of fertile eggs, the proper disintegration of faeces, the

use of a vessel large enough to prevent over-concentration, and a floating fluid whose *ascertained* specific gravity is just over 1,200. Special stress is laid on the last essential. When these essentials were fulfilled the collection of Ascaris eggs averaged 4 to 6 times greater by D.C.F. than by the Willis technique; moreover, the lowest and highest counting by D.C.F. varied as 1 to 1·5, those by the Willis technique as 1 to 18 or 1 to 28 according as to which form of it was used. If there was used for floatation a three-quarters-saturated salt solution, the strength optimum for showing up hookworm eggs, the loss of Ascaris and Trichuris eggs was great. Stating the actual deliveries as percentages of a total content otherwise ascertained, the figures for Ascaris got by D.C.F. and by the two variations of the Willis technique, when all used a saturated common salt solution, were 42, 7 and 13; and when all used a three-quarters-saturated solution they were 4, 1 and 3; the corresponding figures for Trichuris eggs were 25, 6 and 10 for the saturated and 1·6, 5 and 6 for the three-quarters-saturated solution.

As to prevention, some of the evidence for air-borne infection is repeated [see this *Bulletin*, 1934, Vol. 31, p. 605] and the further evidence of HEADLEE [this *Bulletin*, 1937, Vol. 34, p. 449] is noted. There is added the report by BULL [this *Bulletin*, 1937, Vol. 34, p. 431] on the excellence of widely used borehole latrines as breeders of cockroaches and so as possible disseminators of Ascaris eggs, not as an advocacy for the discarding of latrines but as a reminder that the teaching of behaviour theoretically good may produce a condition practically bad—an urgent need of something better as a latrine—no easy matter to devise but admitting of no complacency or relaxation of effort. *C. L.*

YOSHIDA (Sadao) & TOYODA (Kazunaga). **Artificial Hatching of Ascarid Eggs.**—*Livro Jubilar do Prof. L. Travassos.* Rio de Janeiro. 1938. pp. 569–577. With 9 figs.

The essence of the results of this paper are found in its Table 7 which gives the percentage of "dog ascaris" "human ascaris" and "pig ascaris" eggs which have hatched out in five days in 17 different media. Taking "human ascaris," the average of the percentages of successful hatchings in media which are not digestive juices is 41·5. For the digestive juices they were—artificial gastric juice 22, bile 28, pancreatic juice 31, artificial intestinal juice 1. In these media the most favourable temperature was between 36° and 40°C. At temperatures down to 24° few embryos hatched, but those that did were more active and more resistant to chemicals. [The writers give no references. A number will be found quoted as for this *Bulletin* in the review 1934, Vol. 31, p. 605, in which also there is reference to BROWN's report that the only condition which inevitably produced hatching of mature eggs was drying followed by moistening.] *C. L.*

PIRES (Jesus Ribeiro). Asphyxia, obstrucção intestinal e abcesso por ascaris. [**Asphyxia, Intestinal Obstruction and Abscess from Ascaris.**]—*Brasil-Medico.* 1938. Oct. 29. Vol. 52. No. 44. pp. 987–988.

After urging that patriotism demands a clearing up of parasites in the 70 to 80 per cent. of Brazilians who have worms, Pires describes 3 of "innumerable" clinical cases of Ascaris infection. The first was a

child who died of asphyxia from 2 ascarids in the trachea [see this *Bulletin*, 1929, Vol. 26, p. 987]. The second was one of 12 years old, gravely ill with a great ileo-caecal swelling diagnosed as a haematoma, on which after consultation it was decided to operate next day ; but in the meantime one of the family gave a tea of the herb Santa Maria with expulsion of 280 ascarids and disappearance of the " haematoma " [see this *Bulletin*, 1924, Vol. 21, p. 957 ; 1925, Vol. 22, pp. 489, 490 ; 1927, Vol. 24, p. 189]. The third was a large extraperitoneal hypogastric abscess with foetid pus and a decomposing Ascaris.

C. L.

Flamini (Silvio). Contributo allo studio delle perforazioni intestinali da ascaridi. [**On Intestinal Perforation by Ascaris.**]—*Riforma Med.* 1938. Nov. 5. Vol. 54. No. 44. pp. 1701–1703. With 1 fig.

A child of 5 was admitted with evidence of acute appendicitis. On its operative removal, the head half of an Ascaris was found filling the lumen of an inflamed appendix, the tail half being passed in the first stool. Near the organ's apex there was a solution of continuity affecting mucosa and muscular coat with a haematoma under the peritoneum. On histological examination only the serosa was entire. Convalescence was uninterrupted. Literature on the subject is discussed but the editor found no room for the list of references. [See this *Bulletin*, 1936, Vol. 33, p. 109 ; 1937, Vol. 34, p. 23.] *C. L.*

Caiado (Itiberê de Castro). Oclusão intestinal por ascaris. [**Intestinal Obstruction by Ascaris.**]—*Brasil-Medico.* 1938. July 16. Vol. 52. No. 29. pp. 657–662. [16 refs.] English summary.

After a tussle with a schoolmate the inguinal hernia in the right scrotum of a boy of 13 disappeared and he had severe right iliac pains. Internal strangulation of the hernia was suspected. Laparotomy revealed in the left iliac fossa loops of the ileum adherent to one another and filled, it is said, with a great number of ascarids and abundant faecal matter. The appendix was long and inflamed. It was excised, the adhesions were cut through, the mass in the ileum propelled into the caecum, and pituitary extract given. Apparently the ascarids passed only numbered 12, in answer to a vermifuge given after his discharge from hospital. *C. L.*

Lecercle. Pancréatite aiguë hémorragique et ascaride. [**Acute Haemorrhagic Pancreatitis and Ascaris.**]—*Bull. Acad. Méd.* 1939. Mar. 7. 103rd Year. 3rd Ser. Vol. 121. No. 9. pp. 342–344.

Acute rapidly fatal haemorrhagic pancreatitis of which a probable aetiological factor was the presence in the bile ducts near the duct of Wirsung of an Ascaris 22 cm. long. *C. L.*

Chanco (Pedro P.), Jr. **An Unusual Exit of an Adult Ascaris from a Child.**—*Jl. Philippine Islands Med. Assoc.* 1938. Nov. Vol. 18. No. 11. pp. 709–714. [21 refs.]

A child of 3, whose umbilicus had discharged at intervals since the cord separated after birth, was seen to have a reddish projection from it which hurriedly withdrew when a stick of silver nitrate was put on it.

Next day it showed again, when wiped with cotton it came out a little further, and was seized with forceps and pulled out with ease, but evidently with pain to the child followed by great relief. There were still eggs in the faeces but the sinus healed. [See this *Bulletin*, 1935, Vol. 32, p. 257.] *C. L.*

Ghose (A. K.). **A Case of *Ascaris lumbricoides* Infection simulating Cerebral Type of Malaria.**—*Indian Med. Gaz.* 1938. Oct. Vol. 73. No. 10. p. 614.

Vanni (V.). Ascaridiose et phénomène de Sanarelli. [**Ascariasis and the Sanarelli Phenomenon.**]—*C. R. Soc. Biol.* 1938. Vol. 129. No. 34. pp. 1052–1055.

From the use of the coelomic fluid of *Parascaris equorum* for injection into rabbits, it is concluded that ascarids contain a substance which produced in 3 of 20 sensitized rabbits the cutaneo-visceral haemorrhagic allergy described by Sanarelli.

There was massive shedding of epithelium particularly in kidney and intestine, and haemorrhages into skin and viscera ; and, in line with experimental results, certain symptoms which occur in this infection in man and particularly in children (urticaria, convulsions and asthma) are attributed to allergy in susceptible individuals caused by the body fluid of the worms. *C. L.*

i. Macheboeuf (M.) & Mandoul (R.). A propos de la toxicité des extraits d'*Ascaris*. [**Toxicity of Ascaris Extracts.**]—*C. R. Soc. Biol.* 1939. Vol. 130. No. 10. pp. 1032–1034.

ii. Mandoul (R.). Etude comparative de la toxicité des extraits d'*Ascaris* et de Taenia. [**Toxicities of Ascaris and Taenia compared.**]—*Ibid.* pp. 1035–1036.

i. The toxic substance which *Ascaris megalocephala* contains, given intravenously in appropriate dose, kills a guineapig in a few minutes. It is not precipitated by trichloracetic acid, and does not pass through collodion. It is not then a toxic amine like histamine, nor an albumin or globulin, nor a toxin like those of bacteria, nor is it like a phytotoxine.

ii. *Moniezia expansa* has no such toxic substance as has *A. megalocephala*. That of the latter resides not only in the coelomic fluid but in the tissues and is far better extracted by trichloracetic acid than by normal saline. *C. L.*

RABIES.

A Review of Recent Articles. XXXI*

i. *Virus.*

Kligler and Bernkopf[1] state that they have now succeeded in cultivating the virus of rabies in the developing chick embryo. In one

* For the thirtieth of this series see this *Bulletin*, 1939, Vol. 36, p. 193.

[1] Kligler (I. J.) & Bernkopf (H.). Cultivation of Rabies Virus in the Developing Chick Embryo. [Correspondence.]—*Nature*. 1939. May 27. Vol. 143. No. 3630. pp. 899–900.

series the virus has been carried through nine and in a second through six successive passages without loss of virulence. The virus is present both in the allantois and in the brain, but always in higher concentration in the latter. This success (*cf.* this *Bulletin* 1939, Vol. 36, p. 193) depends apparently on the age of the embryo at the time of infection as well as at the time of passage. With embryos of eight days or more the results are usually negative, but embryos of 5–6 days are readily infected and serial passages can be maintained without any difficulty if they are made 9–10 days after infection. The embryo brain removed 9–10 days after the infection was infective for mice in dilutions of 1 : 1000 to 1 : 10,000. Passages from embryo to embryo can be made with emulsions of either allantois or embryo brain.

The successful cultivation of the virus of Aujeszky's disease on the chorio-allantoic membrane of the chick is reported by GLOVER.[2] The strain has now been carried through 55 generations. "The strain has become modified in its effect upon laboratory animals. The period of incubation has been lengthened, local pruritus is no longer produced, and the characteristic pulmonary lesions are much diminished in intensity; nevertheless the virus is still as lethal as infective rabbit brain." The observation of MESROBEANU (this *Bulletin*, 1938, Vol. 35, p. 643) is thus confirmed.

A test which, it is stated, distinguishes fixed from street virus is suggested by LEGEZYNSKI.[3] White mice are inoculated intracerebrally with a small quantity of a 1 in 10 dilution. If the strain is fixed virus then the incubation remains constant in successive subpassages. On the contrary with street virus, subpassages through white mice (after an initial passage in the rabbit) give varying incubations, and after 4 to 6 the strain becomes avirulent, and the mouse survives. A result of this nature cannot be obtained with white rats.

A process is described by NICOLAU[4] for staining the elementary corpuscles obtained by fractional and repeated ultra-centrifugalization (3,000 to 6,000 revolutions per minute), and subsequent digestion by trypsin or papaine, from suspensions of brain material of animals which died of rabies, or of Aujeszky's disease. A film is made of the deposit, and dried at 37°C. This is fixed in the flame or in methyl alcohol. A staining solution containing :—

Isamine blue (Grübler)	1 gm.
Carbolic acid	3 gm.
Ethyl alcohol	10 cc.
Distilled water	100 cc.

is poured upon the film, which is warmed over a flame for 10 minutes. After washing in tap water and drying, the film is examined. In both rabies and Aujeszky's disease, small coccal forms are seen with 1,000 magnification. The dimensions of these forms vary from 90 to 250 mμ.

[2] GLOVER (R. E.). Cultivation of the Virus of Aujeszky's Disease on the Chorio-Allantoic Membrane of the Developing Egg.—*Brit. Jl. Experim. Path.* 1939. Apr. Vol. 20. No. 2. pp. 150–158.

[3] LEGEZYNSKI (Stanislaw). Différences dans le comportement du virus fixe de la rage et des virus de rue inoculés par passages dans l'encéphale des souris blanches.—*C. R. Soc. Biol.* 1939. Vol. 130. No. 12. pp. 1321–1322.

[4] NICOLAU (S.). Méthode très simple pour la coloration de certains corpuscules élémentaires (inframicrobes, agents, étiologiques de maladies à ultravirus) : psittacose, vaccine, rage, herpès, maladie d'Aujeszky, peste aviaire.—*C. R. Soc. Biol.* 1939. Vol. 130. No. 10. pp. 993–996. [13 refs.]

A strain of virus designated " J," which had, during 187 passages covering 6 years, become fixed with an incubation period of 3 days, and with which Negri bodies had never been found in the horn of Ammon, was kept by JONNESCO[5] in 30 per cent. glycerine at 6°C. for a period of 144 days. The first rabbit inoculated thereafter had an incubation period of 16 days, and numerous Negri bodies were found. After 15 subsequent passages the incubation had shortened to 3 days ; Negri bodies were not found after 5 passages. Thus prolonged exposure to glycerine produces an alteration, which takes a number of passages to wear off.

ii. *Symptoms and Diagnosis.*

After a comprehensive summary of the earlier literature relating to the paralytic form of human rabies, PAWAN[6] cites a case which he observed in 1919 in Trinidad. The bite was inflicted by a cat, and the symptoms which supervened were inability to swallow and paralysis of the leg and body, culminating in death. He then goes on to describe the symptoms which were observed in the epidemic of paralytic rabies in Trinidad in 1931.

A general article on the diagnosis of rabies in man and in animals is contributed by CONNELL.[7]

iii. *Pathology.*

That infection with rabies can be achieved by the introduction of an emulsion of an aggressive strain of street virus into the bladder is shown by REMLINGER and BAILLY.[8] Three dogs were so treated, and in each case rabies supervened, as shown by subsequent animal inoculation. The authors point out that this does not prove that infection took place through the mucosa of the bladder. The emulsion may on the one hand have ascended into the ureter, and on the other the urethra may have been damaged, although every precaution was taken to avoid this latter possibility. The authors have obtained a positive result only with aggressive street virus strains.

In a second communication REMLINGER and BAILLY[9] show that the virus of Aujeszky's disease is similarly transmissible. Out of three experiments with this virus two gave positive results.

Changes in the cholesterin and lipoid content of blood serum and organs after infection with Aujeszky's virus are described by JONNESCO and ZUGRAVESCO.[10] Cholesterin, which in normal rabbit serum

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[5] JONNESCO (Démètre). Modification durable du virus rabique renforcé " J " due à la glycérine.—*C. R. Soc. Biol.* 1939. Vol. 130. No. 6. pp. 578–580. With 1 chart. [11 refs.]

[6] PAWAN (J. L.). Paralysis as a Clinical Manifestation in Human Rabies.—*Ann. Trop. Med. & Parasit.* 1939. Mar. 31. Vol. 33. No. 1. pp. 21–29. [22 refs.]

[7] CONNELL (John H.). The Diagnosis of Rabies.—*New Orleans Med. & Surg. Jl.* 1938. Dec. Vol. 91. No. 6. pp. 302–304.

[8] REMLINGER (P.) & BAILLY (J.). Transmission de la rage au chien par voie vésicale.—*C. R. Soc. Biol.* 1938. Vol. 129. No. 31. pp. 739–741.

[9] REMLINGER (P.) & BAILLY (J.). Transmission de la maladie d'Aujeszky au chien par voie vésicale.—*C. R. Soc. Biol.* 1938. Vol. 129. No. 34. pp. 1057–1058.

[10] JONNESCO (D.) & ZUGRAVESCO (I.). La cholestérine dans le sérum sanguin et les lipoides totaux dans les organes, au cours de la maladie d'Aujeszky.—*C. R. Soc. Biol.* 1939. Vol. 130. No. 6. pp. 581–583.

measures 49·26 mgm. per 100 cc. rises in Aujeszky's disease to 73·94. The lipoids of the brain, normally 47·81 gm. per 100 gm. dry material, decrease to 44·68. The lipoids of the heart increase from 20·97 gm. per 100 in the normal rabbit to 24·35 in animals which have died of the disease. The lipoids in the spleen rise to 21·75 gm. per 100 as compared with 15·39 in the normal. Thus in Aujeszky's disease there is an increase in the cholesterin of the blood, an increase of total lipoids in the heart and spleen, and a decrease in the lipoids of the brain.

Jonnesco[11] reports that he has obtained a powerful antirabic serum in an ass treated with phenol vaccine (5 per cent. brain material, 1 per cent. phenol, heated 3 days at 37°C.) The neutralizing power of this serum has remained constant (1 to 5) during a year. Of 5 guineapigs which had been intracerebrally inoculated with rabies virus after having received three 10 cc. doses of antirabic serum, three showed prolongation of the incubation period. The fresh serum of the immunized ass contained neurotoxins which gave rise to symptoms of irritation. Heating of the serum for 10 minutes at 56°C., or keeping it at 6°C. for 2 weeks destroyed the neurotoxins, without affecting its viricidal power.

iv. *Methods of Treatment and Statistics.*

In a scholarly article Remlinger[12] discusses the considerations which govern antirabic treatment. He discusses methods of treatment, and in particular the relative efficacies of living and dead vaccines in the treatment of bitten persons. After summarizing the experimental and statistical evidence he concludes that phenolized vaccines have an efficacy at least equal to other vaccines, and in particular to dried cords; that they are inoffensive in that four times as many accidents occur with living vaccines as with dead; that they can be produced with a maximum of economy and convenience. He draws attention to the fact that throughout the world more persons are treated by phenol vaccines than by all other methods combined, and that in no instance has an Institute which adopted treatment by phenol vaccine abandoned this method of treatment and reverted to its original method.

In a further communication Remlinger and Bailly[13] describe experiments comparing treatment by dried cords, with treatment by phenol vaccines (Semple). Of 10 rabbits treated with dried cords 7 contracted rabies; of 20 treated by Semple's vaccine 12 died, whilst of an untreated control group of 12, 9 contracted the disease. In a similar experiment with dogs, 2 out of 8 died after treatment with cords, 3 out of 10 after treatment with Semple's vaccine, and 7 out of 8 of the untreated. They conclude from these experiments that Semple's vaccine affords a degree of protection at least equal to that given by dried cords.

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[11] Jonnesco (Démètre). Recherches sur un sérum anti-rabique.—*C. R. Soc. Biol.* 1939. Vol. 130. No. 11. pp. 1145–1148.

[12] Remlinger (P.). Quelques considérations sur le traitement antirabique.—*Rev. d'Hyg. et de Méd. Préventive.* 1939. Apr. Vol. 61. No. 4. pp. 241–251. [12 refs.]

[13] Remlinger (P.) & Bailly (J.). Comparaison des vaccins antirabiques phéniqués et des moelles desséchées.—*Bull. Acad. Méd.* 1939. Jan. 10. 103rd Year. 3rd Ser. Vol. 121. No. 1. pp. 27–30.

A series of experiments has been carried out by LÉPINE and SAUTTER[14] to determine whether there is any difference in the time of appearance of immunity after treatment by dried cords and treatment by Fermi's phenol vaccine. To answer this question, parallel groups of rabbits received daily treatment for 5, 10 and 15 days by each of the two methods. These treatments were so arranged that the last injection for each series was given on the same date. Ten days later a test dose was given to each animal. It appeared that with a treatment of 5 days by dried cords the incubation period was prolonged, but no animal was saved, whilst treatment by Fermi's vaccine was totally inefficacious. With a 10 days' treatment by dried cords 5 out of 6 contracted rabies, whilst when the treatment was that of Fermi there were no deaths from rabies amongst 4 animals. With 15 days' treatment in the case of dried cord treatment 3 of 3 died of rabies, whilst in the case of Fermi's treatment none out of 4 contracted the disease. The authors conclude that 10 days is a minimum for treatment by Fermi's method, and that even 15 days is inefficacious when treatment is by dried cords, although a certain " precocity " in the date of onset has been observed. [Confirmation of these results would appear to be called for.]

Experimental observations on the results of treatment of mice with formolized tissue culture virus are reported by KLIGLER and BERNKOPF.[15] The cultures were prepared according to the method of Webster and Clow. " After 4 to 5 days incubation the cultures were centrifugalized in large tubes, the supernatant fluid removed, and the sediment triturated with a glass pestle. The ground material was resuspended in the supernatant fluid and 0·1 per cent. formalin added. As a rule the titre of the culture was tested by mouse inoculation before adding the formalin ; the cultures used contained from 5,000 to 50,000 lethal mouse units per cc. All vaccines were tested for sterility, and also for inactivity by intracerebral inoculation into at least 2 mice."

A first series of experiments was designed to ascertain the immunizing effect of varying doses and number of injections. " Out of a total of 29 mice given 5 to 7 injections of inactivated virus intraperitoneally 13 (45 per cent.) were fully immune to at least 10 lethal intracerebral mouse units of test virus, and 4 (13·5 per cent.) were partially immune as indicated by prolonged incubation period (14 to 24 days) 2 or 3 times that of the controls. One group of 5 mice which received only 1 injection of vaccine, succumbed to the test virus in the same period as the controls." The controls numbered 13, none of which survived the test dose.

In a second series the test dose was given intraperitoneally. In this case immunity was more easily established, and it was found that " even a single intraperitoneal treatment with the inactivated culture virus is sufficient to protect mice against an intraperitoneal infection with a dose of fresh virus which kills about two-thirds of the control mice. A similar immunity is conferred against a subcutaneous infection except that a larger amount of vaccine is required."

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[14] LÉPINE (P.) & SAUTTER (V.). Moment d'apparition de l'immunité antirabique chez les lapins traités.—*C. R. Soc. Biol.* 1939. Vol. 130. No. 7. pp. 617–618.

[15] KLIGLER (I. J.) & BERNKOPF (H.). Studies on Antirabic Immunization with Formolized Culture Virus.—*Brit. Jl. Experim. Path.* 1938. Dec. Vol. 19. No. 6. pp. 378–383.

From 1919 to 1928 the vaccine employed in Prague was prepared after the formula of Cumming. Owing to the occurrence of paralytic sequelae the method was at the latter date changed to that of Fermi, and since then no troublesome sequelae have been encountered. From various experiments BOUČEK[16] found that phenol in a concentration of 1 per cent. had a toxic action on mice. He has accordingly introduced a modification. A 10 per cent. suspension of brain substance in 1 per cent. phenol saline is prepared, and kept at 20°C. Before use the suspension is diluted with an equal quantity of normal saline. Such a suspension induces no toxic symptoms in mice, and the immunizing properties of the vaccine are not impaired.

An epizootic of rabies commencing in November, 1934, is described by LEWILLON.[17] Following the canine epizootic twelve persons were given antirabic treatment. One of these in spite of treatment by Fermi's method died of rabies.

Of 2,331 persons treated at the Haffkine Institute at Bombay[18] during the year 1936, 2 (0·08 per cent.) contracted the disease in spite of treatment by Semple's vaccine. Full statistical tables relating to the persons treated are given by SOKHEY.

Of 2,399 persons treated in Palestine[19] during the year 1937, 2 (0·10 per cent.) contracted the disease. The vaccine used is that of Semple. One neuro-paralytic accident occurred. The case proceded to recovery. "It is of interest to observe that this is the first case of paralytic accident in Palestine since 1932, since which year 8,741 persons have received antirabic inoculations."

Rules regarding the indications for antirabic treatment as applied in the German Institutes are published by BOECKER and JAHN.[20]

v. *Rabies in Animals.*

An epizootic of rabies commenced in the Settlement of Singapore,[21] in June 1937. During the months of September, October and November eleven dogs died of the disease, making a total, including the original case, of twelve cases, five of which occurred in dogs which had been vaccinated prophylactically. Mass vaccination was carried out from September onwards, and a total of 11,942 dogs were treated.

SMITH, MCGUIRE, STEPHENS and LAHIRI[22] draw attention to the fact that "no death from hydrophobia has been reported" at the Pasteur Institute at Kasauli and its out-centres "during the past 30

[16] BOUČEK (J.). Notre modification du vaccin antirabique.—*Travaux Inst. d'Hyg. Pub. Etat Tchécoslov.* 1938. Vol. 9. No. 3–4. pp. 125–128.

[17] LEWILLON (R.). Contribution à l'étude nosologique de la région de Stanleyville.—*Ann. Soc. Belge de Méd. Trop.* 1938. June 30. Vol. 18. No. 2. pp. 353–368. With 1 chart. [Rabies pp. 364–367.]

[18] BOMBAY: REPORT OF THE HAFFKINE INSTITUTE FOR THE YEAR 1937 [SOKHEY (S. S.), Director]. [Rabies pp. 26–28; 53–88.]

[19] PALESTINE: DEPARTMENT OF HEALTH. ANNUAL REPORT FOR THE YEAR 1937.—[Rabies pp. 92–95; 106–108.]

[20] BOECKER (Eduard) & JAHN (Gertrud). Die Indikation der Wutschutzbehandlung.—*Reichs-Gesundheitsblatt.* 1939. Jan. 25. Vol. 14. No. 4. pp. 58–59.

[21] MALAYA: REPORT ON THE VETERINARY DEPARTMENTS FOR THE YEAR 1937 [WHITWORTH (S. H.), Director of Vet. Research & Vet. Adviser].—Rabies pp. 60–77. With 2 plates.

[22] SMITH (R. O. A.), MCGUIRE (J. P.), STEPHENS (E. D.) & LAHIRI (B. N.). The Treatment of Animals with Antirabic Vaccine.—*Indian Med. Gaz.* 1938. Dec. Vol. 73. No. 12. pp. 736–739.

years for infections caused by horses, cows, donkeys or buffaloes, although the saliva of these species of animals has been proved by different workers to contain the virus." They then discuss the treatment of animals which have been exposed to infection. Using the same vaccine as is used for human treatment, but in larger doses (which vary according to the weight of the animal) over a period of 7 days, they have obtained the following results.

	1936		1937	
	Number	Died of rabies	Number	Died of rabies
Dog	645	2	711	3
Horse, mule	10	0	25	3
Cow, bullock, buffalo ...	4	0	27	0
Elephant	—	—	1	0
Cat	1	0	—	—
Monkey	—	—	1	0
Totals ...	660	2	765	6

vi. *Post-Vaccinal Paralysis.*

A case of accident after treatment by Calmette's method is described by Horack.[23] The patient developed encephalitis but showed no symptoms of paralysis. "The patient's family history and the manner in which he reacted to the vaccine suggested that the local reactions and early manifestations of generalized lymph node enlargement might be viewed as an allergic response to the protein contained in the nervous tissue of the vaccine, and that the clinical picture of encephalitis which followed" (papilloedema, headache, vomiting, increased c.s.f. pressure) "might likewise be an allergic response to the protein of the inocula." Impressed by this, Horack made a survey of 16 persons known to have had severe accidents as the result of treatment, and compared them with a control group of 45 persons in which no neuroparalytic accidents had occurred. In 87·5 per cent. of the former group, personal or family history of allergic disease was elicited, as compared with 33·3 per cent. of the latter. A method of desensitization was successfully employed in 3 cases which had, or developed, a marked sensitivity to the antirabic vaccine.

vii. *Miscellaneous.*

In a lengthy article Balozet[24] discusses rabies as it occurs in tropical and subtropical countries, its geographical distribution, the animal vectors, and the nature of the strains of virus. *Oulou fato* and the epizootics of paralytic rabies which occur in South America are dealt with, and measures of prophylaxis and treatment are discussed.

[23] Horack (Harold M.). Allergy as a Factor in the Development of Reactions to Anti-Rabic Treatment.—*Amer. Jl. Med. Sci.* 1939. May. Vol. 197. No. 5. pp. 672–682. [22 refs.]

[24] Balozet (L.). Etat actuel de nos connaissances sur la rage dans les contrées tropicales et sub-tropicales et sa prophylaxie. La vaccination préventive des chiens.—*Arch. Inst. Pasteur de Tunis.* 1938. Dec. Vol. 27. No. 4. pp. 450–469.

A summary of present-day knowledge regarding the bat-borne rabies is given by EVERLING.[25] He deals first historically with the epizootics among cattle and horses in South America, then with the human epidemic in Trinidad, and finally with the rôle of the bat in their transmission.

A short description with illustrations of a living *Desmodus rotundus rotundus* sent to Paris from the Argentine is given by ROMAÑA.[26] This is followed by a short note on the various species of Desmodus which are concerned in the transmission of rabies.

An interesting article on rabies in Trinidad, and in particular on the rôle of the vampire bat in its transmission, is contributed by SLIMON.[27]

KIRK[28] reports that sulphanilamides appear to have no effect on rabies. Three rabbits were infected subdurally with fixed virus (Paris strain) and given 1 cc. daily of "Prontosil soluble" intravenously for the following six days. A fourth was kept as a control. All four rabbits were moribund by the seventh day, and showed typical symptoms of paralytic rabies.

From a study of the records of 7,200 rabbits which had been infected with rabies at Tonking during a period of 5 years, DODERO[29] finds evidence of seasonal variation. The year at Tonking is divided into 3 seasons, the first from February to April when the climate is fresh and moist, the second from May to October when it is hot and rainy, the third from November to January when it is fresh and dry. The mean duration of incubation diminishes abruptly from April to June, and rises again slowly during November and December. The curve of the "mortalité precoce" (that is the proportion of rabbits which die before the date at which they would ordinarily be killed for vaccine) is lowest in February and highest in October. (Figs. 2 and 3 of this article should be transposed.)

That the blood of animals suffering from rabies is rarely infective is well known. REMLINGER and BAILLY[30] in a recent experiment failed to obtain infection from the blood of 12 infected rabbits, the blood being drawn at different stages of the infection and inoculated in large quantity into the muscles of the neck of guineapigs (2 in each case). The extreme rarity of positive results adds interest to two observations in which blood was taken not directly from the infected animals, but from ticks which infested them, and in which infection with rabies resulted from inoculation of this minimal quantity of blood. These two positive results occurred in a series of similar experiments on 30 dogs. The ticks which were used were of the

[25] EVERLING (W.). Lyssa-Uebertragung durch Fledermäuse.—*Arch. f. Schiffs- u. Trop.-Hyg.* 1939. Mar. Vol. 43. No. 3. pp. 102–116. [41 refs.]

[26] ROMAÑA (C.). Présentation d'un vampire vivant (*Desmodus rotundus rotundus* E. Geoffroy).—*Bull. Soc. Path. Exot.* 1938. Dec. 14. Vol. 31. No. 10. pp. 885–887. With 3 figs. on 2 plates.

[27] SLIMON (J. G.). Rabies Paralytica in Trinidad.—*Jl. Roy. Nav. Med. Serv.* 1939. Apr. Vol. 25. No. 2. pp. 142–156. With 4 figs.

[28] KIRK (R.). Sulphanilamides and Rabies. [Correspondence.]—*Nature.* 1939. Jan. 14. Vol. 143. No. 3611. p. 77.

[29] DODERO (J.). Climat tonkinois et rage expérimentale du lapin.—*Ann. Inst. Pasteur.* 1939. Jan. Vol. 62. No. 1. pp. 121–125. With 3 figs.

[30] REMLINGER (P.) & BAILLY (J.). Développement possible du virus rabique dans l'organisme de la tique du chien (*Rhipicephalus sanguineus*).—*Ann. Inst. Pasteur.* 1939. Apr. Vol. 62. No. 4. pp. 463–467.

species *Rhipicephalus sanguineus*. Similar experiments with leeches (*Limnatus nilotica*) gave negative results. The authors do not suggest that the tick may convey infection to man. It is, however, possible that the virus of rabies may develop in the stomach of the tick.

In a second paper[31] the same authors discuss the paresis which may develop in man from the bite of a tick, and describe experiments on rabbits and guineapigs in which a non-fatal paresis but not a paralysis developed after inoculation of the stomach contents of ticks which had been fed on healthy dogs.

The relationship between concentration of galactose in the urine and local reactions during anti-rabies inoculation is discussed by Cruveilhier, Dieryck and Viala.[32] In the urine of 14 out of 15 persons who experienced erythema or urticaria, the concentration of galactose was increased as compared with a normal as derived from 9 persons who were unaffected by local reactions. The authors attribute this variation to a functional deficiency of the liver, which gives rise to hypersensitiveness. *A. G. McKendrick.*

[31] Remlinger (P.) & Bailly (J.). Contribution à l'étude expérimentale des accidents déterminés par la tique du chien (*Rhipicephalus sanguineus*).—*Ann. Parasit., Humaine et Comparée.* 1939. Jan. 1. Vol. 17. No. 1. pp. 1–3.

[32] Cruveilhier (L.), Dieryck (J.) & Viala (C.). Nature des accidents locaux non septiques observés pendant le traitement antirabique.—*Ann. Inst. Pasteur.* 1939. June. Vol. 62. No. 6. pp. 652–660.

TRYPANOSOMIASIS.

Précis of Abstracts in this Section.

The Report of the Sleeping Sickness Service of Nigeria for 1937 (p. 736) is mainly a record of administrative matters, but from an experiment on two patients it is concluded that four 2 gm. doses of tryparsamide did not increase the resistance of the parasites to this drug.

From a study of the 66 inhabitants of a village in Southern Rhodesia, Blair (p. 736) concludes that there is little evidence to support the view that *T. brucei* and *T. rhodesiense* are identical, and that infection is not stored in a game animal reservoir. In this village there were 2 persons with *T. rhodesiense* in the blood and tsetse flies were abundant, yet other inhabitants were not infected, though European and native visitors had been infected. These visitors had either not before been exposed to tsetse, or had been exposed only to low densities.

Corson (p. 737) records chronic infection in monkeys infected with *T. gambiense* through *G. morsitans* and suggests that similar chronic infections, possibly undiagnosed, may occur in man.

Lefrou and Goarnisson (p. 738) demonstrate that in the Ivory Coast non-infected persons show very much the same ocular lesions as those infected with sleeping sickness. Optic neuritis may occur in the uninfected and in the infected before treatment, but papillitis may be due to a second stage disease; it does not suddenly end in atrophy. Old cases of trypanosomiasis in adults often show complete decolouration of the papilla, and in these medication with pentavalent arsenicals undoubtedly plays a part in the production of optic atrophy.

The authors discuss other conditions in connexion with the aetiology of ocular lesions.

Symes and Southby (p. 740) report on the reduction of *G. palpalis* by the block method over an area of 713 acres along the shore of Lake Victoria. Hand-catching of adults was more effective than collection of pupae, and trapping was ineffective. The decrease in the numbers of *G. palpalis* was from 50 to 90 per cent., and the total cost about £878. Large numbers of flies cross stretches of open water 400 yards wide. Elimination was not achieved but even with high densities of fly hand-catching can be employed successfully and economically and it is hoped that eradication will soon be completed.

As a result of further observation of volunteers for experimental infection with *T. rhodesiense*, Corson (p. 741) finds that they remained so well in health after completion of treatment that he now thinks that some of the complications suffered by them while treatment was in progress may have been due to the germanin used. Hawking (p. 742) found that germanin had practically no trypanocidal action on *T. rhodesiense in vitro*, but that trypanosomes incubated with it and then inoculated into mice failed to infect. The amount absorbed by these trypanosomes was small. In the estimation of germanin in the blood, Vierthaler and Boselli (p. 742) point out that the serum of small animals, before administration of the drug, gives some yellow colouration, which varies from day to day, with the reagents used. It is therefore necessary to estimate this colouration shortly before administration. The amount of germanin in the blood falls slowly and protection against subsequent infection with *T. brucei* is afforded at levels as low as 1 mgm. per 100 cc. van den Branden (p. 743) obtained prolonged incubation period and temporary sterilization of the blood by exposing rats to the vapour of germanin before and after *T. brucei* had appeared in the blood.

Pop and Budac (p. 743) found that anticoman has only a feeble therapeutic action in rats infected with *T. brucei* and *T. equiperdum*, but that the prophylactic action was rather better, though the drug must be given at the same time as the infection. Its action is directly on the parasites.

Lagodsky (p. 743) failed to protect a rabbit by a dose of p. aminophenylstibinate of methylglucamine against subsequent infection by an arsenic-resistant strain of *T. annamense*, but there was a definite influence in attenuating the virulence and pathogenic power of the parasite.

van den Branden (p. 744) concludes that astreptine has no action on rats infected with *T. brucei*. The sulphate of ortho-oxy-quinoline has some trypanocidal action *in vitro*.

Launoy (p. 744) found, in mice, that a single dose of 4 cgm. orsanine was more lethal than the same amount given in 3 separate doses at 4 and 3 hours' interval. A large single dose effected more cures in mice infected with *T. brucei* than the same amount spread over several doses, and the longer the intervals the less was the efficacy of the drug. He considers that similar tests should be made in man.

Mannozzi-Torini (p. 745) gives a method, depending on the differential centrifuging of blood containing trypanosomes and diluted with citrate-saline, for obtaining an emulsion of living trypanosomes for experimental work. He (p. 745) showed that proteolysis occurred in a mixture of *T. evansi* and casein on incubation at *p*H 5·9.

ROUBAUD and PROVOST (p. 746) observed that the growth of three young mice infected with *T. gambiense* was arrested, especially one which lived for 5 months after infection. Infantilism has been recorded in infections with *T. cruzi*.

NICOLLE and SIMONS (p. 746) observed that the sedimentation rate in guineapigs infected with *T. equiperdum*, *T. brucei* and *T. evansi* was increased. YORKE in comment thinks that this phenomenon is to be related to the auto-agglutination which he has shown to take place in trypanosomiasis if the blood is cooled.

FRENCH (p. 747) working with *T. congolense* and *T. brucei* in animals finds a sharp fall in blood sugar before a crisis or death. Acidosis exists and increases before death, and blood lactic acid increases.

BINNS (p. 747) shows that there is considerable difference in the susceptibility of individual small laboratory animals to *T. congolense* and that different strains of the trypanosome appear to vary in pathogenicity. Conclusions drawn from a small number of inoculations, therefore, are likely to be fallacious.

DELIDIMITRIOU (p. 747) obtained hopeful results in the treatment of 270 cattle with surfen C. The infection was with *T. congolense*. VAN SACEGHEM (p. 748) also reports favourably on surfen C given intramuscularly in doses of 1 gm. per 100 kilo. in cattle. This may be repeated after 5 days. The drug acts better in *T. congolense* than in *T. vivax* infection.

T. equiperdum multiplies readily in rabbit's testicles and lesions develop in 4–8 days. SOLDINI (p. 748) makes use of this fact for the diagnosis of dourine when trypanosomes may be difficult to find. He inoculates the blood or, better, serous fluid from the genital lesions into the testicles of a rabbit. For purposes of diagnosis he prefers this method to the intrapalpebral reaction of Lanfranchi and Soni, the formolgel, or the complement fixation test.

ZWEMER and CULBERTSON (p. 748) noting the similarity between the terminal spasms in rats infected with pathogenic trypanosomes and those observed in cases of potassium poisoning examined the serum-potassium level throughout the course of infection of these animals with *T. equiperdum* and found that there is a marked increase beginning 24 hours or so before death. They infer that this is the direct cause of death rather than an endotoxin, a hypoglycaemia, or asphyxia.

POINDEXTER (p. 749) notes that young rats respond to *T. equiperdum* infection by increase of mononuclear leucocytes more readily than do older animals. This trypanosome was rendered avirulent, if not actually killed, in 20–30 minutes when subjected to a temperature of 41°C.

KOLMER and RULE (p. 749) found that sulphanilamide, orally or intravenously, was ineffective in the treatment of rats infected with *T. equiperdum*.

JAUFFRET (p. 749) found that antiplague vaccination of cattle in Cambodia produced rise of temperature which, in 5 per cent. of some thousands of cattle over 8 years old, was accompanied by the presence of *T. evansi*. This, however, reacted readily to naganol. It is inferred that these cattle are a reservoir of *T. evansi*.

LLOVEROL (p. 749) reports good results from treating sheep inoculated with *T. dimorphon* with 15–20 cc. of normal Cynocephalus serum. In debilitated animals there is grave risk in applying such treatment.

Duca (p. 750) investigated the cause of susceptibility of young rats to *T. lewisi* as compared with older rats. This infection was found to be highly pathogenic for rats less than 25 days old and survivors showed a marked leucocytosis and monocytosis. In fatal cases there was marked secondary anaemia, but absence of this leucocyte response. Culbertson and Kessler (p. 750) rendered rats—the older more easily than the young—resistant to *T. lewisi* by repeated injection of formolized homologous antigen. Culbertson (p. 751) observed that, when germanin was injected into nursling rats infected with *T. equiperdum*, the parasites were observable for 30–36 hours, whereas in older rats they disappeared within 15 hours, owing, it is believed, to the reticulo-endothelial response by way of which the drug is thought to act.

He (p. 751) finds that resistance to *T. lewisi* infection is conferred upon young rats nursed by a mother who has been passively immunized after parturition. The same author (p. 751) found that specific antiserum given *per os* (0·5 cc. per 10 gm. body weight) imparts to young rats resistance to infection by *T. lewisi*. This resistance diminishes with age and in old rats is nil. It may be that the intestine becomes impermeable to the antibody or denaturizes it. He again (p. 752), in order to ascertain whether increased resistance with age of the subject (man and animals) was due to enhanced reaction on the part of protective cells, inoculated rats ranging in age from 6 to 60 days with 1 per cent. trypan-blue, killed them 18 hours later and examined the phagocytic activities of the tissue cells. The only variations worth noting were in the liver; the Kupffer cells in the older rats revealed a much greater phagocytic activity than those in the younger. The author takes this as answering his query in the positive.

Mazza and his colleagues (p. 752) in a series of papers record cases of Chagas' disease in various parts of the Chaco country and have noted that a fairly large proportion of *Triatoma infestans* caught in the dwelling were infected.

Brumpt (p. 753) brings further experimental evidence to support the view that it is by way of the excreta and not by bite that reduviid bugs transmit *T. cruzi* infection.

Pifano (p. 753), on the ground that *Psammolestes arthuri*, a reduviid bug of Venezuela, is easily infected experimentally with *T. cruzi*, thinks it may possibly be a natural transmitter. This insect has not yet been found outside Venezuela. Ferreira and Deane (p. 754) made analogous observations regarding the Hemiptera *Clerada apicicornis* which is widely distributed in the Amazon estuary where many animals are found naturally infected with *T. cruzi*.

Deane and Jansen (p. 754) have found a small opossum, *Marmosa cinerea*, a reservoir host of *T. cruzi* in the State of Pará.

Talice and Rial (p. 754) report yet another case—this is called the twentieth—of Chagas' disease in Uruguay.

Kolodny (p. 755) has carried out, with *T. cruzi*, investigations analogous with those of Culbertson on *T. lewisi* (v.s.) regarding the increasing resistance of rats with age. Susceptibility is marked to the time of weaning (25–35 days) after which resistance is observed and increases to a maximum at maturity, though still existent through life. This is not due to any specific antibody because injection of the serum of normal adult rats did not affect the course of infection in young susceptible animals. The resistance is present whether infection is *per os* or by the peritoneum. The same author (p. 755) has observed

that with *T. cruzi* (as has been noticed with diphtheria toxin in guinea-pigs, and the viruses of encephalitis and endemic typhus in mice) young rats suffer less in the summer than in the autumn, winter and early spring.

Romaña (p. 756) has produced his "sign" experimentally by conjunctival deposition of the faeces of an infected *Rhodnius prolixus*.

H. H. S.

Nigeria. Report on the Medical Services for the Year 1937 [Briercliffe (R.), Director]. Appendix B. pp. 67–73.—**Report of the Sleeping Sickness Service, 1937.**

The year 1937 has been a period of transition. The Colonial Development Fund is providing £19,000 per annum for five years for sleeping sickness control measures on the understanding that Nigeria provides a further £11,000 for the expansion and improvement of treatment in addition to maintaining the normal running of the service. The appointment of a second entomologist and ten sleeping sickness control officers was approved, and the entomologist, five of the control officers and a foreman arrived in October. Six of the eight R.A.M.C. British Non-Commissioned Officers who were to take over the sleeping sickness teams arrived towards the end of the year. While the new officers were being trained, work was continued on the same lines as in 1936.

Owing to shortage of staff, it was rarely possible to keep more than one officer at Gadau. A full programme of entomological work has been continued there and some chemotherapeutic research has been done. The experiment on tryparsamide resistance referred to in the 1936 report has been continued. Thirty monkeys were injected with blood from untreated sleeping sickness cases; and after the patients had received four 2 gm. injections of tryparsamide, another series of monkeys was inoculated from them. In two instances the strain was isolated both before and after treatment. The characteristics of the two strains have been studied, but no significant differences could be detected, from which it is concluded that in these two patients four 2 gm. doses of tryparsamide did not increase the resistance of the parasite to the drug.

Owing to the absence of the entomologist from Gadau, there has been no opportunity of working out the research data which had been accumulating. The report concludes with certain remarks on therapeutic measures, sleeping sickness control and the Anchau Settlement Scheme.

W. Yorke.

Blair (D. M.). **Human Trypanosomiasis in Southern Rhodesia, 1911–1938.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1939. Apr. 6. Vol. 32. No. 6. pp. 729–742. With 1 map. [10 refs.]

The paper commences with a description of the history of tsetse fly occupation in Southern Rhodesia, the position today and the outlook for the future. The author then deals with the history of human trypanosomiasis in Southern Rhodesia and with the events leading up to the 1934 Medical Survey. Cases of human trypanosomiasis reported in Southern Rhodesia from 1909 to 1938 are shown in a table. In all, there have been eight European cases with six deaths, and 45 native cases with 29 deaths.

Special reference is made to the state of affairs in the Gowe district. This is a thickly wooded river plain situated at the junction of the Umniati and Msongwa rivers. It has a large and varied game population and was always heavily infested with tsetse. When the author visited it in 1935 he found the tsetse not only in the surrounding bush but right in among the huts of the village, where they proved extremely troublesome. This is not a usual finding in villages of similar size situated in fly areas and Blair believes that it has an important bearing on the epidemiology of sleeping sickness in Southern Rhodesia. The present inhabitants settled in Gowe in 1930, having moved from a site about 25 miles to the south, and the community now consists of 5 alien native fishing boys, and indigenous natives comprising 8 adult males, 25 females and 28 children. Their communal health had on the whole been good, and there was no record of outstanding mortality.

On the afternoon of his arrival, the author examined the whole population, but because of the annoyance caused by the tsetse fly, material secured was not examined on the spot but taken to Robb's Drift. Two so-called carrier cases of trypanosomiasis were discovered, *viz.*, Kahondera, the headman of the village, and Zariro, a middle-aged male. Blood films in each case showed a heavy infection with *T. rhodesiense*, *P. falciparum* and *Microfilaria perstans*. Neither patient apparently gave any definite history of illness. Details are given of a number of cases which can be directly connected to the Gowe focus.

Summarizing his experience at Gowe, the author concludes that it lends little support to the view that *T. brucei* and *T. rhodesiense* are the same organism. Blair believes that a local outbreak of the disease always follows the establishment of the man-fly-man cycle, and that the infection is not stored in a game animal reservoir but in a human reservoir. In the case of Kahondera, the trypanosomes were present in the peripheral circulation at every examination and in relatively large numbers, so that he would act as an extremely efficient reservoir. The genesis of the carrier state is a very interesting problem. Kahondera's trypanosome had the virulence and lethal effect on experimental animals associated with *T. rhodesiense* infections. If it is presumed that Kahondera and Zariro infected the village tsetse, the flies were apparently unable to produce any acute cases of the disease in the other inhabitants of the village, and yet they were able to infect quite a large proportion of the casual visitors to the village, both European and native, these visitors being individuals who had either never been exposed to tsetse before or only exposed to low fly densities. The paper concludes with certain speculations on the explanation of carriers. *W. Y.*

Corson (J. F.). **A Final Note on a Strain of *Trypanosoma gambiense* transmitted through Monkeys by *Glossina morsitans*.**—*Ann. Trop. Med. & Parasit.* 1939. Mar. 31. Vol. 33. No. 1. pp. 91–93.

This note concludes Corson's observations on the strain of *T. gambiense* transmitted through monkeys by *G. morsitans* [this *Bulletin*, 1937, Vol. 34. p. 921 and 1939, Vol. 36, p. 208]. Attention is drawn to one or two errors in the table of the third note, *viz.*, monkey 115 had lived for 238 days instead of 537, as stated ; and monkey 110 had lived for 202 days and not for 501. About the end of 1938, Corson decided to end the experiment by chloroforming the remaining monkeys

and examining the cerebrospinal fluid microscopically. The results are shown in a table. Details are given of 13 monkeys, which lived for periods varying from 289 to 1,174 days after inoculation. Trypanosomes were found in the cerebrospinal fluid of five of these monkeys and the cell count was considerably increased in all except one. It is interesting to note that the findings in the monkey which lived 1,174 days were trypanosomes 50 and white cells 640. Corson states that the interest of such infections in susceptible monkeys is that they suggest that similar chronic infections, possibly undiagnosed, may occur in man. *W. Y.*

LEFROU (G.) & GOARNISSON (J.). Les lésions oculaires chez les noirs trypanosomés, avant tout traitement. L'importance des carences alimentaires. [**Ocular Lesions in Natives infected with Trypanosomes before Treatment : the Importance of Alimentary Defects.**]—*Bull. Soc. Path. Exot.* 1939. Apr. 4. Vol. 32. No. 4. pp. 424–437.

It appeared to the authors, who wished to study systematically the lesions occurring in the depth of the eye during treatment of sleeping sickness, that it was essential to know first what changes were found before any treatment was administered.

The authors carried out their work at Onagadougou in the Mossi country of the Ivory Coast. They examined 1,232 cases of sleeping sickness—425 new and 807 old cases. The latter had in general received only one course of atoxyl or tryparsamide in 1935. As a control the eyes of 537 persons not suffering from trypanosomiasis were also examined. The difficulties confronting ophthalmoscopic examination of natives are mentioned, and the manner in which these difficulties were overcome is discussed. The results of the investigation are summarized in a table in which the nature of the lesions, the period of the disease, and the sex and age period (man, woman or child) are given. These tables are so interesting that they are reproduced here.

Results of Ocular Examinations of Trypanosomal and Non-Trypanosomal Natives.

Not Infected.

	1st Period			2nd Period			Total	Per cent.
	M.	W.	C.	M.	W.	C.		
Slight pallor ...	23	8	29	—	—	—	60	11·1
Complete decolouration ...	6	1	2	—	—	—	9	1·6
Papillitis ...	6	10	5	—	—	—	21	3·9
Chorio-retinitis	11	6	7	—	—	—	24	4·4
Synchysis ...	2	1	0	—	—	—	3	0·55
Iritis	2	1	0	—	—	—	3	0·55
Total ...	50	27	43	—	—	—	120	22·3
Examined ...	170	146	221	—	—	—	537	—
Total examined	537			—				

New Cases.

	1st Period			2nd Period			Total	Per cent.
	M.	W.	C.	M.	W.	C.		
Slight pallor ...	9	19	30	10	9	10	87	20·4
Complete decolouration ...	3	3	3	0	1	1	11	2·5
Papillitis ...	1	6	6	5	4	4	26	6·1
Chorio-retinitis	1	2	0	4	1	0	8	1·8
Synchysis ...	1	0	2	0	0	0	3	0·7
Total ...	15	30	41	19	15	15	135	31·7
Examined ...	60	114	129	41	42	39	425	—
Total examined	303			122				

Old Cases.

	1st Period			2nd Period			Total	Per cent.
	M.	W.	C.	M.	W.	C.		
Slight pallor ...	32	19	32	15	3	9	110	13·6
Complete decolouration ...	13	7	1	5	2	1	29	3·5
Papillitis ...	5	4	2	1	0	0	12	1·4
Chorio-retinitis	4	2	0	0	1	1	8	0·9
Synchysis ...	1	1	0	0	0	0	2	0·2
Iritis	1	0	0	1	0	0	2	0·2
Total ...	56	33	35	22	6	11	163	20·1
Examined ...	248	204	184	67	46	58	807	—
Total examined	636			171				

It will be seen that the non-infected persons show very much the same lesions as those infected with trypanosomes. Women exhibit slight pallor of the papilla much less frequently than men and children, and complete decolouration indicative of optic atrophy is more common in men than in women and children.

The evolution of the disease towards the second stage seems to exert a special influence on the appearance of papillitis; contrary, however, to general opinion this early stage of optic neuritis does not suddenly end in atrophy; the latter lesion is much less frequent than the former. Attention is drawn to the fact that papillitis is rare in old treated cases. Optic neuritis is often only a manifestation of a localized meningitis of the sheath of the optic nerve.

There is a trypanosomal papillary neuritis just as there is a syphilitic papillary neuritis. As this neuritis is not associated with diminution of visual acuity and can only be recognized by the ophthalmoscope, it is often unnoticed.

Old cases of trypanosomiasis in adults exhibit more frequently complete decolouration, and in these medication with the pentavalent arsenicals undoubtedly plays a part in the production of the optic atrophy, the optic nerves of adults being much more sensitive than those of children. Recent cases showed pallor in 20·4 per cent. of cases, complete decolouration in 2·5 per cent., papillitis in 6·1 per cent., and chorio-retinitis in 1·8 per cent. Old cases showed slight pallor in 13·6 per cent., complete decolouration in 3·5 per cent., papillitis in 1·4 per cent., and chorio-retinitis in 0·9 per cent. In all 31·7 per cent. of recent cases and 30·1 per cent. of old cases exhibited ocular lesions.

The general conclusion appears to be, firstly that before any treatment sleeping sickness patients may present ocular lesions, particularly optic neuritis; and secondly that such lesions are not necessarily pathognomonic since they are found in non-infected cases.

The remainder of the paper is concerned with a discussion regarding the aetiology of the ocular lesions. The authors consider the possible influence of syphilis and of filarial and other helminthic infestations. They then go on to the question of nutritional deficiencies, and state that they are very inclined to think that in Mossi the minor signs of optic neuritis such as a simple pallor of the papilla are due principally to defects of diet which appears to be particularly poor in vitamin C and to a less extent in vitamin A. The paper should be consulted in the original by those interested. *W. Y.*

Symes (C. B.) & Southby (R.). **The Reduction of *G. palpalis* in a Lake Shore Area by the "Block" Method.**—Fol. 4+32 pp. With 4 folding diagrams, 1 map & 22 photographs. 1938. Nairobi. [Summarized in *Rev. Applied Entom.* Ser. B. 1939. May. Vol. 27. Pt. 5. pp. 98–99.]

"A detailed account is given of an experiment carried out between March 1935 and September 1937, in which an attempt was made to eliminate *Glossina palpalis*, R.–D., from an area along the shore of Lake Victoria in Kenya Colony by the "block" method, which had been used successfully along infested rivers. Brief notes are given on the topography, vegetation, climate and fauna of the area, and on the incidence of sleeping sickness and the habits of the population. Descriptions of the 6 clearings include their locations, dimensions, the type of original bush that had to be cleared, the cost and progress of clearing, and their present state. The technique used for reducing the fly is outlined, and descriptions are given of each block, together with the details of the measures carried out and the results obtained. Points of interest relating to trapping, to the bionomics of *G. palpalis*, and of *G. pallidipes*, Aust., and *G. brevipalpis*, Newst., the two other species of tsetse fly found in the area, and to the recovery of the fly population after reduction by collection of adults and pupae are discussed.

"The following is taken from the authors' summary and conclusions: A total area of 713 acres was cleared at a cost of approximately £900. The amount of clearing was about twice as much as that necessary for isolating the infested blocks of bush, the extra clearing being undertaken to facilitate early settlement and agricultural production. Fly reduction was accomplished by hand-catching of adults, collection of pupae, and trapping; the first method was the most economical, the second was much more costly, and the last was ineffective. The

decrease brought about in the numbers of *G. palpalis* on the mainland varied between approximately 50 and 90 per cent.; the small fly population on Hanete Island was practically eliminated in 3½ months. The total cost of fly reduction measures, excluding the nominal value of traps, was approximately £878. Data collected indicate that *G. palpalis* can maintain itself at a low density by breeding in sugar-cane and banana plantations. Its pupal period in the area concerned lasts 43–53 days. The season of its maximum activity is from April to June and that of maximum reproduction from April to September. Considerable movement of fly occurs along the shore and between the mainland and islands, and although this is aided by pedestrian and canoe traffic, large numbers of flies cross stretches of open water as much as 400 yards wide. The periods of maximum adult activity and maximum reproduction in *G. pallidipes* and *G. brevipalpis* occur at the same time as those of *G. palpalis*. Settlement and development have progressed satisfactorily. Elimination was not achieved, but the reduction accomplished and the experience gained indicate that, even with high densities of fly, hand-catching can be employed successfully and economically. It is hoped that the eradication of *G. palpalis* in this area will be completed in the near future."

CORSON (J. F.). **A Further Note on Some African Volunteers in Experimental Work with** *Trypanosoma rhodesiense.*—*Ann. Trop. Med. & Parasit.* 1939. Mar. 31. Vol. 33. No. 1. pp. 97–99.

In a recent note [this *Bulletin*, 1939, Vol. 36, p. 667] the author recorded a somewhat high incidence of various illnesses in Africans who had volunteered for experimental infection with *T. rhodesiense*. These illnesses occurred during or after treatment with germanin, both in patients who had become infected and in others who had resisted. The author concluded that there was no reason to attribute these complications, except albuminuria, to the action of germanin or to infection with *T. rhodesiense*, and suggested that such illnesses were not exceptional in the local population to which the volunteers belonged. Since writing the above, about the middle of October 1938, the author was able to see nearly all the volunteers weekly up to February 1939, when the present note was written.

Of the original 43, 1 had died and 4 had left the district. Of the remaining 38, only 3 had anything more than trivial disturbances of health. One of these had diarrhoea in October and a short attack of acute bronchitis with fever in November. The second had diarrhoea and an undiagnosed fever of four days' duration in November; and the third suffered from pain in his left foot which lasted nearly a month. The last case is of interest because a few other volunteers had complained of similar pains during or soon after treatment, and one had obviously suffered from very severe pain. LESTER [this *Bulletin*, 1937, Vol. 34, p. 521] reported mild peripheral neuritis after the administration of germanin, and thought the drug had caused it.

Excluding such infections as malaria, relapsing fever, schistosomiasis, filariasis, abscess and venereal disease, 13 of the volunteers were recorded in the previous paper as having had some disturbance of health during or soon after their course of treatment of germanin. The 38 volunteers who have been under close observation during the

last few months have kept so well in health that Corson is now doubtful whether germanin did not play some part in the production of these illnesses. *W. Y.*

HAWKING (Frank). **Contribution on the Mode of Action of Germanin (Bayer 205).**—*Ann. Trop. Med. & Parasit.* 1939. Mar. 31. Vol. 33. No. 1. pp. 13–19. [12 refs.]

The object of this paper is to describe *in vitro* experiments upon the trypanocidal action of germanin, with a view to comparing the behaviour of this compound with that of the trivalent arsenicals and acriflavine. The trypanosomes used were the reviewer's strain of *T. rhodesiense* and the same parasite made resistant to germanin by means of Jancsó's technique.

It was found that germanin had practically no trypanocidal action *in vitro*, but that if normal trypanosomes are incubated with it *in vitro* and then washed and inoculated into mice, they fail to infect. Germanin-fast trypanosomes do not lose their infectivity under these conditions. The amount of germanin absorbed by the trypanosomes *in vitro*, as judged by chemical estimation, is small; and no difference was detected between normal and resistant trypanosomes in this respect. *W. Y.*

VIERTHALER (R. W.) & BOSELLI (A.). Die Bedeutung kleinster Germaninmengen im Kaninchenblut als Schutz gegen eine Infektion mit *Trypanosoma brucei*. [**The Significance of the Smallest Doses of Germanin in Rabbit Blood as a Protection against Infection with** *T. brucei*.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1939. Apr. Vol. 43. No. 4. pp. 149–160. With 5 figs.

Lang's method for the estimation of germanin in blood, as improved by Dangerfield, Gaunt, and Wormall, was examined by the present authors and found to be of value both in the case of plasma and serum. A number of parallel estimations made in the plasma and serum of different samples of blood did not give identical results; sometimes the plasma values were a little higher than those of the serum, and sometimes the reverse was the case.

Attention is drawn to the fact that the serum of small animals before the administration of germanin gives a certain amount of yellow colouration with the reagents. This is supposed to be due to amines produced in the blood by hydrolysis. The blank value (Blindwert) varies, not only in different rats and rabbits, but also in the same animals on different occasions. The variation noticed in one rabbit on different days amounted to 0·72 mgm. per 100 gm. It follows, therefore, that estimation of germanin by the method in question can only be accurate if the blank value is obtained shortly before the drug is given.

The authors give curves showing the amount of germanin found in the blood of rabbits at various periods from 5 minutes up to 10 days after the administration of 10 mgm., 4·5 mgm., 3·5 mgm., and 2·5 mgm. per kilo of body weight respectively. Having ascertained these values they then proceeded to inoculate a considerable number of rabbits with *T. brucei* at periods when the concentration of drug in the serum was estimated to be at levels falling as low as 1 mgm. per 100 cc. All the rabbits were protected. [See also this *Bulletin*, 1938, Vol. 35, p. 714.] *W. Y.*

VAN DEN BRANDEN (F.). Etude de l'action des vapeurs de " Bayer " 205 sur le rat blanc infecté de trypanosome " Brucei ." [**Study of the Action of the Vapour of Bayer 205 on Rats infected with** *T. brucei*.]—*Ann. Soc. Belge de Méd. Trop.* 1938. Sept. 30. Vol. 18. No. 3. pp. 515–522. With 1 fig.

A description of the technique and apparatus used is given. The solutions vapourized consisted of 40 cc. of a 5 or 10 per cent. solution of the drug. In all, 14 animals were used in the experiments. In animals treated in this way before trypanosomes appeared in the blood the incubation period was prolonged for 4 to 15 days. No animal in which the parasites were present in the blood when treatment commenced were cured, but temporary blood sterilization was obtained. *W. Y.*

POP (Al.) & BUDAC (O.). Le traitement du nagana et de la dourine expérimentale chez le rat par l'anticoman. [**The Treatment of Nagana and Dourine in the Rat by Anticoman.**]—*C. R. Soc. Biol.* 1938. Vol. 129. No. 34. pp. 1229–1232.

The authors have repeated the work of SCHERN and ARTAGAVEYTIA-ALLENDE on the trypanocidal action of anticoman. [This substance is a mixture of synthalin bitartrate, pancreas powder, sodium phosphate, tannic acid and bismuth subnitrate ; it was found to be less toxic than synthalin alone. For previous work on this subject see this *Bulletin*, 1936, Vol. 33, p. 204 ; and 1937, Vol. 34, pp. 132, 553.]

Pop and Budac administered the compound in suspension subcutaneously in rats infected with *T. brucei* and *T. equiperdum*. They found that its therapeutic action was but feeble, maximal doses only sufficing to produce a certain proportion of cures. The prophylactic action was rather better, but it was necessary to give the compound at the same time as the trypanosomes were injected. It is concluded that anticoman acts directly on the parasites and not by producing a hypoglycaemia—a conclusion reached some time ago by the reviewer and his colleagues, who proved that the action of synthalin and allied compounds is direct. [This *Bulletin*, 1938, Vol. 35, p. 342 and 343.]

W. Y.

LAGODSKY (H.). Atténuation de la virulence et du pouvoir pathogène d'un trypanosome (*T. annamense*, chimio-résistant), après passage dans un organisme animal, traité par Sb. [**Attenuation of the Virulence and Pathogenic Action of a Trypanosome (an Arsenic-Resistant Strain of** *T. annamense*), **after Passage through an Animal treated with Antimony.**]—*Bull. Soc. Path. Exot.* 1939. Jan. 11. Vol. 32. No. 1. pp. 35–38.

The observations recorded in this paper began with a rabbit which was given a preventive dose of a pentavalent antimonial, viz., p. aminophenylstibinate of methylglucamine, followed 6 hours later by an injection of five million arsenic-resistant *T. annamense*. On the ninth day the rabbit's blood was positive, but it never exhibited any of the usual external signs of disease, although the blood was always positive up to the time it was sacrificed on the 35th day.

On different occasions two guineapigs, a mouse and Rabbit 2 were subinoculated from Rabbit 1. One of the guineapigs recovered

spontaneously and the blood of the others was cleared by a dose of tryparsamide. The mouse died of the infection in four days. Rabbit 2 became infected, but resisted tryparsamide treatment; it likewise never developed external lesions up to the time it was killed. The strain was passed on through two other rabbits from which guineapigs, mice and Rabbit 5 were inoculated. It apparently continued to exhibit the same characters.

The author concludes from this that although the prophylactic dose of the antimonial had no preventive action, nevertheless it had a definite influence on the parasite in that it attenuated its virulence and its pathogenic power. *W. Y.*

VAN DEN BRANDEN (F.). Recherche sur l'action de l'astreptine Meurice (P-aminophénol-sulfonamide) sur le Trypanosoma "Brucei." [**The Action of P. Aminophenol Sulphonamide on *T. brucei*.**]—*Ann. Soc. Belge de Méd. Trop.* 1938. Dec. 31. Vol. 18. No. 4. pp. 693–694.

The conclusion reached is that astreptine (p. aminophenol sulphonamide) has no action on rats infected with *T. brucei*. *W. Y.*

VAN DEN BRANDEN (F.). Le sulfate d'ortho-oxy-quinoléine (chinosolsunoxol) a-t-il une action in vivo sur des rats blancs infectés de Trypanosoma "Brucei"? [**Has the Sulphate of Ortho-Oxy-Quinoline any Action on Rats infected with *T. brucei* ?**]—*Ann. Soc. Belge de Méd. Trop.* 1938. Dec. 31. Vol. 18. No. 4. pp. 695–698.

It was found that although this substance had no therapeutic action on rats infected with *T. brucei* it had some trypanocidal action *in vitro*. *W. Y.*

LAUNOY (L.). Résultats de l'application des doses médicamenteuses réfractées, injectées à courts intervalles dans les trypanosomoses expérimentales. [**The Results of the Administration of Fractional Doses of Drugs at Short Intervals in the Treatment of Experimental Trypanosomiasis.**]—*Bull. Acad. Méd.* 1939. Apr. 18. 103rd Year. 3rd Ser. Vol. 121. No. 14. pp. 550–556.

Whilst the object of the experimenter and the clinician in the treatment of trypanosomiasis is the same, *i.e.* the sterilization of the infection, the conditions under which they work are different; the experimenter can take risks, but the clinician cannot run the risk of poisoning his patient.

The author has conducted a long series of experiments on mice with the objects, firstly, of ascertaining whether the frequent administration of fractional doses is less toxic than the administration of the whole dose at once, and secondly, whether such a procedure is as effective from the therapeutic point of view. The toxicity experiments were performed on normal mice, groups of at least 20 animals being used in each observation, and the therapeutic experiments on mice infected with *T. brucei*. The drugs employed were orsanine and the trivalent antimonial compound "anthiomaline."

In the toxicity experiments with orsanine it was found that when 4 cgm. was given at a single injection, 11 of 20 mice died, but when this dose was divided into 3 fractional doses (1·0, 1·5 and 1·5 cgm

respectively), given at intervals of 4 and 3 hours, only 5 of the 20 died. Similar results were obtained with the antimony compound.

In the therapeutic experiments with orsanine it was found that a single dose of 3 mgm. cured 100 per cent. of mice.

Fractional doses of 1 mgm. given 24, 28, 32 and 48 hours respectively after infection, cured 27 of 28 mice; three similar fractional doses given at the 24th, 28th and 32nd hours cured all of 7 mice. When the interval between the injection of the fractional doses was increased to 24 hours, the number of cures fell to 50 per cent. and when it was still further increased to 48 or 72 hours, the number of cures fell progressively to nil. The results with the antimonial, although not quite so clear-cut, showed the same thing.

From this work, Launoy considers that a case is established for testing the method on man. *W. Y.*

Mannozzi-Torini (Manno). Una tecnica per la separazione dei tripanosomi dal sangue circolante e preparazione di emulsioni di tripanosomi. [**A Technique for the Separation of Trypanosomes from the Blood and the Preparation of an Emulsion of Trypanosomes.**]—*Boll. Istituto Sieroterap. Milanese.* 1938. Dec. Vol. 17. No. 12. pp. 824–829. With 1 plate. German summary (6 lines).

The blood should be rich in trypanosomes and the author uses that of a guineapig at 8–10 days after intraperitoneal injection of 4·5 cc. of infected blood. This gives 60–70 trypanosomes to 250–300 red cells.

Heart blood is diluted with twice its volume of a 1 in 10 mixture of 4 per cent. citrate in 0·8 per cent. saline. This is centrifuged for not less than 4 minutes at 1,800 revolutions per minute. The red and white cells are spun down but the trypanosomes remain in the supernatant fluid. This fluid is aspirated in one operation into a Pasteur pipette big enough to hold it all. It is then centrifuged at 4,000–5,000 r.p.m. for 4 minutes. This throws down all the trypanosomes and the clear supernatant fluid is pipetted off. The sediment, though sometimes consisting of trypanosomes only, more often contains a lower stratum of red cells. It is therefore suspended in 10–15 cc. 0·8 per cent. saline and spun for 3 minutes at 1,800 r.p.m. The red cells are sedimented and the trypanosomes remain in the supernatant fluid, which is pipetted off and again spun as before at the high velocity.

The sediment consists only of trypanosomes and in saline forms the optimum material for the study of the physiology and biochemistry of the trypanosomes, which are still alive.

Repetition of the process will eliminate all proteins and other substances contained in the plasma. *C. W.*

Mannozzi-Torini (Manno). Studio di un fermento proteolitico nel tripanosoma della surra (Evansi). [**Studies on a Proteolytic Ferment of** *T. evansi*.]—*Boll. Istituto Sieroterap. Milanese.* 1938. Dec. Vol. 17. No. 12. pp. 830–838. With 3 graphs. [13 refs.] English summary (9 lines).

The author has tested suspensions of *T. evansi* prepared by the method described above, for proteolytic enzymes, using casein, gelatin and serum. Mixtures of 2 cc. casein (0·5 per cent.), 2 cc. acetic or phosphate buffer at various *p*H values, 2 cc. emulsion of trypanosomes

and 0·25 cc. chloroform are incubated at 38° for 24 hours. The proteins are precipitated and the non-precipitable N is determined by the Kjeldahl method. The result is compared with a determination made on a control mixture without incubation.

It was found that proteolysis occurred especially at *p*H 5·9 and that the protease was inactivated by heat at 70°C. for 20 minutes. Activity with gelatin and serum proteins, though present, was only slight. *C. W.*

Roubaud (E.) & Provost (A.). Arrêts de croissance au cours d'infections à *Trypanosoma gambiense* chez la souris. [**Arrest of Growth in Mice infected with** *T. gambiense.*]—*Bull. Soc. Path. Exot.* 1939. Apr. 4. Vol. 32. No. 4. pp. 387–390. With 2 figs.

The strain used was isolated in Cameroons in 1934, and has since been maintained in guineapigs. In subinoculated mice the infections were chronic and irregular. In order to increase the virulence 4 young mice about 1 month old were inoculated with the guineapig strain on 2nd September, 1938. One died on 4th October without exhibiting trypanosomes in its blood. A detailed history of the other 3 is given. Two died early in October but the third lived until 2nd February, 1939. The most interesting feature about these mice is that their growth appeared to have been arrested. This was particularly noticeable in the case of the third animal, which lived until it was 6 months old (5 months after infection). It weighed only 9 gm. and there was great enlargement of the spleen, liver and thyroid.

The authors recall the infantilism which Chagas attributed to infections with *T. cruzi*, and wonder whether the phenomenon they have observed is related to it. *W. Y.*

Nicolle (P.) & Simons (H.). La vitesse de sédimentation des hématies dans les trypanosomiases expérimentales du cobaye. [**The Sedimentation Rate of the Red Cells in Experimental Trypanosomiasis of the Guineapig.**]—*Bull. Soc. Path Exot.* 1939. Jan 11. Vol. 32. No. 1. pp. 94–103.

Having studied the sedimentation rate of the red cells in guineapigs infected with murine typhus, and having found that it was considerably increased at the beginning of the infection, reaching it maximum and then decreasing rather quickly, it occurred to the authors that they might examine the phenomenon in guineapigs infected with *T. equiperdum*, *T. brucei* and *T. evansi*. The technique used was that employed in the earlier work.

Details are given of observations on a considerable series of infected guineapigs. In all the animals the sedimentation rate was definitely increased. [Probably this is to be related to the auto-agglutination of red cells, a phenomenon well known in trypanosomiasis of man and animals. It was examined by the reviewer nearly 30 years ago; he found that the plasma and serum of infected man and animals contain an autoagglutinin which agglutinates the erythrocytes at low temperatures, but not at blood temperature. If the citrated blood of an infected rabbit is put in a watch glass and the temperature lowered to 5°C. or less, the red cells agglutinate strongly and sediment in a few minutes.] *W. Y.*

French (M. H.). **Studies in Animal Trypanosomiases. V. Some Disturbances of the Host's Carbohydrate Metabolism induced by** *Trypanosoma congolense* **and** *Trypanosoma brucei*.—*Jl. Comp. Path. & Therap.* 1938. Dec. Vol. 51. Pt. 4. pp. 269–281. [39 refs.]

The author has examined the sugar and lactic acid values and the CO_2-capacity of the blood of oxen, sheep and donkeys infected with *T. congolense* and *T. brucei*. His conclusions are as follows :—

" (1) There is no gradual development of hypoglycaemia during *T. congolense* and *T. brucei* infections of large animals, but a sharp fall in the blood sugar level occurs shortly before death or crisis. In animals that are treated or recover without therapeutic aid, the blood sugar level returns to normal immediately crisis is passed.

" (2) The CO_2-capacity appears to fall as soon as the incubation period is over. A further drop usually occurs towards the end of the infection. It can be considered that an acidosis exists during infection and then becomes more pronounced as death approaches.

" (3) Blood lactic acid values increase in the premortal stages and near crisis.

" (4) A marked carbohydrate disturbance is caused in the host by pathogenic trypanosomes, but its mechanism has not yet been elucidated clearly."

[See also this *Bulletin*, 1938, Vol. 35, p. 712 ; 1939, Vol. 36, pp. 215, 216.] *W. Y.*

Binns (H. R.). **Observations on the Behaviour in Laboratory Animals of** *Trypanosoma congolense* **Broden, 1904.**—*Ann. Trop. Med. & Parasit.* 1938. Dec. 21. Vol. 32. No. 4. pp. 425–430.

Blacklock and Yorke [this *Bulletin*, 1914, Vol. 3, p. 169] have drawn attention to the fallibility of conclusions regarding the pathogenicity of *T. congolense* drawn from a small number of inoculations, and to the danger of differentiating strains or species of trypanosomes on the results of such pathogenicity tests. The purpose of the present note is to record the results of the inoculation of small laboratory animals, mainly white rats, with *T. congolense*, causing disease of cattle in the southern province of Nyasaland.

The results of inoculation of seven strains of this trypanosome into laboratory animals are summarized in a table, which shows that there is a considerable difference in the susceptibility of individual animals to the parasites, and that different strains of *T. congolense* appear to vary in pathogenicity. It is considered that the observations recorded in this communication give strong support to the conclusions of Blacklock and Yorke. *W. Y.*

Delidimitriou (G.). Note sur le traitement de la trypanosomiase à congolense par le Surfen C. Bayer. [**Note on the Treatment of** *T. congolense* **by Surfen C.**]—*Ann. Soc. Belge de Méd. Trop.* 1938. Dec. 31. Vol. 18. No. 4. pp. 539–542.

The author treated 270 cattle infected with *T. congolense* with 100 cc. of 2·5 per cent. solution of Surfen C intramuscularly. Of the 253 animals which were re-examined 1 to 6 months later 28 (11 per cent.) were positive. As the author claims, these results based on a single injection are hopeful. [See also this *Bulletin*, 1935, Vol. 32, p. 686 ; 1936, Vol. 33, p. 663 ; 1937, Vol. 34. pp. 118, 119 ; 1938, Vol. 35, p. 343.] *W. Y.*

VAN SACEGHEM (René). Note sur le traitement des trypanosomiases par le Surfen C chez les bovidés. [**Note on the Treatment of Cattle infected with Trypanosomes by Surfen C.**]—*Ann. Soc. Belge de Méd. Trop.* 1938. Dec. 31. Vol. 18. No. 4. pp. 699–703.

The author draws certain conclusions from his observations. The dose given should not be less than 1 gm. per 100 kilo of weight, and it should be given intramuscularly. Trypanosomes do not disappear from the blood for at least 24 hours after treatment. Five days later the blood should be re-examined, and if trypanosomes are present a second dose should be given. Cured animals can be re-infected. The drug acts better on *T. congolense* infections than on *T. vivax* infections.

In the author's opinion Surfen C is a drug of great value. It is preferable to tartar emetic and has the great advantage that it can be given intramuscularly. Unfortunately, however, its price is prohibitive. *W. Y.*

SOLDINI (M.). Procédé pratique et rapide de diagnostic expérimental de la dourine. [**A Rapid and Practical Method of diagnosing Dourine.**]—*Bull. Soc. Path. Exot.* 1939. Mar. 8. Vol. 32. No. 3. pp. 334–341.

After stressing the importance of dourine as a disease of Algerian horses, Soldini discusses the various methods which are used for diagnosis in view of the difficulty in finding trypanosomes, *i.e.* the intrapalpebral reaction of Lanfranchi and Soni, the formol-gel reaction and the complement fixation test.

The method recommended by the author is the inoculation of the serous fluid from the genital lesions of the horse, or, failing this, its blood, into the testicles of a rabbit. The rabbit's testicles form an eminently suitable medium for the multiplication of *T. equiperdum* and lesions develop between the 4th and 8th days. *W. Y.*

ZWEMER (Raymund L.) & CULBERTSON (James T.). **The Serum Potassium Level in *Trypanosoma equiperdum* Infection in Rats: the Rôle of Potassium in Death from this Infection.**—*Amer. Jl. Hyg.* 1939. Jan. Vol. 29. No. 1. Sect. C. pp. 7–12. With 1 fig. [16 refs.]

The authors discuss the various theories which have been advanced to explain the deaths of rats infected with pathogenic trypanosomes and conclude that none of the three theories, *viz.*, the production of an endotoxin, the development of hypoglycaemia, or asphyxiation, affords an adequate explanation of the phenomenon.

It seemed to the authors that there was a superficial similarity between the terminal spasms of rats infected with pathogenic trypanosomes and the spasms in fatal potassium poisoning; and it was considered that possibly death in trypanosomal infections might result from an elevation of the serum potassium above the critical threshold. It was therefore decided to follow the potassium level of the serum of rats throughout the course of infection with *T. equiperdum* with a view to determining whether potassium could play a significant rôle as the cause of death in this infection.

Experiments showed that, as a matter of fact, the serum potassium level of rats dying of *T. equiperdum* is markedly increased, and that

this increase commenced about 24 hours before death. Accordingly, it is suggested that this elevated serum potassium is a significant factor in the cause of death. *W. Y.*

Poindexter (Hildrus A.). **Relationship of Mononuclear Response to Resistance in Experimental Trypanosomiasis.**—*Amer. Jl. Hyg.* 1939. May. Vol. 29. No. 3. Sect. C. pp. 111–114.

Young rats have more flexible mononuclear response to stimulation than older rats, and this response is associated with a greater response to *T. equiperdum* and its products. A temperature above 41°C. kills or renders *T. equiperdum* avirulent *in vitro* or *in vivo* within 20 to 30 minutes. *W. Y.*

Kolmer (John A.) & Rule (Anna M.). **Sulfanilamide in the Treatment of Experimental Trypanosomiasis of Rats.**—*Proc. Soc. Experim. Biol. & Med.* 1939. Jan. Vol. 40. No. 1. pp. 77–79.

The general conclusion reached in this work is that sulphanilamide, either by intravenous or oral administration, is ineffective in the treatment of *T. equiperdum* infections of rats. *W. Y.*

Jauffret (R.). Contribution à l'étude du surra des bovidès au Cambodge. [**Surra in Cambodia Cattle.**]—*Rec. Méd. Vét. Exot.* 1939. Jan.–Mar. Vol. 12. No. 1. pp. 5–14.

Blood examination of 4,668 cattle more than 8 years old revealed the fact that 5 per cent. were infected with *T. evansi*. The infection was only discovered after antiplague vaccination, and the appearance of trypanosomes always followed the febrile disturbance provoked by the vaccine. These observations show that cattle constitute the reservoir of *T. evansi*. Treatment by naganol gave good results. [See also this *Bulletin*, 1938, Vol. 35, p. 330.] *W. Y.*

Pavlov (P.) & Guenev (Chr.). Recherches sur un trypanosome (*Trypanosoma evansi* Steel 1885) trouvé dans le sang d'un cheval de la région de Bourgas en Bulgarie. (Note préliminaire.)—[**A Trypanosome** (*T. evansi*) **found in a Horse in Bulgaria.**]—*Ann. Parasit. Humaine et Comparée.* 1939. Mar. 1. Vol. 17. No. 2. pp. 158–161. With 2 figs. [16 refs.]

The authors describe and figure a trypanosome found by them in a horse at Bourgas, Bulgaria, which they identify as *T. evansi*.

W. Y.

Lloverol (H.). Le sérum normal de cynocéphale (*Papio papio*, Desm.) dans le traitement de la trypanosomiase expérimentale du mouton à *T. dimorphon*, Laveran et Mesnil. [**Cynocephalus Serum in the Treatment of Experimental** *T. dimorphon* **Infections of Sheep.**]—*Bull. Soc. Path. Exot.* 1939. Mar. 8. Vol. 32. No. 3. pp. 328–334.

The author used 8 sheep in his experiments. All were inoculated subcutaneously with *T. dimorphon* Laveran and Mesnil isolated from a naturally infected sheep. Three of the animals were kept as controls

and 5 were treated with the serum of a normal Cynocephalus. Protocols of the observations are set out at length.

The author concludes from his work that a single dose of 15 to 20 cc. of the serum given intravenously is able to produce sterilization of a sheep experimentally infected with *T. dimorphon*. He considers that he cured 2 of his 5 sheep. The serum, however, may produce serious and even fatal results in debilitated animals. *W. Y.*

Duca (Charles J.). **Studies on Age Resistance against Trypanosome Infections: II. The Resistance of Rats of Different Age Groups to *Trypanosoma lewisi*, and the Blood Response of Rats infected with this Parasite.**—*Amer. Jl. Hyg.* 1939. Jan. Vol. 29. No. 1. Sect. C. pp. 25–32. With 1 fig. [12 refs.]

The earliest investigators had observed that young rats suffered more intense and more frequently fatal infections from *T. lewisi* than did older animals. Casual observations by Duca on some hundreds of rats in the Department of Bacteriology at Columbia University revealed a higher mortality from *T. lewisi* to occur in suckling rats, and it was decided to investigate the problem methodically.

After it had been established that rats of different ages differ in their resistance to *T. lewisi*, an attempt was made to investigate the actual mechanism responsible for the age difference. The leucocyte response and the erythrocyte picture were studied in considerable detail. The following are the conclusions :—

" (1) There is a sharp difference in the resistance against *Trypanosoma lewisi* among rats of different ages. *T. lewisi* is markedly pathogenic for rats 25 days of age or younger, and in them frequently causes death. Death because of *T. lewisi* infection occurs only rarely in rats more than 25 days old.

" (2) Rats which survive a *T. lewisi* infection exhibit about the time of the crisis, a marked leucocytosis and a marked absolute monocytosis. This white cell response does not occur in rats which die from *T. lewisi* infection.

" (3) Rats infected with *T. lewisi* exhibit a marked secondary anaemia. This is probably a major factor in the death of rats less than 25 days of age."

W. Y.

Culbertson (James T.) & Kessler (Walter R.). **Studies on Age Resistance against Trypanosome Infections: III. Vaccination of Rats against *Trypanosoma lewisi*, with Special Reference to the Response of Different Age Groups.**—*Amer. Jl. Hyg.* 1939. Jan. Vol. 29. No. 1. Sect. C. pp. 33–43. [15 refs.]

It was found that rats can be rendered completely resistant to *T. lewisi* by the repeated injection of formolized homologous antigen. Among mature rats a few injections given at intervals of several days sufficed to produce complete resistance to injections of large numbers of living parasites. Older rats respond considerably better than younger rats. They respond promptly with the production of agglutinin, and the titre of the agglutinin developed is roughly related to the degree of resistance shown against the living organisms. Sucklings manifest only feeble capacity to produce agglutinins, and some of the younger animals succumb to vaccination quite as readily as non-vaccinated rats of the same age. *W. Y.*

CULBERTSON (James T.). **Studies on Age Resistance against Trypanosome Infections. IV. The Activity of Germanin (Bayer 205) upon *Trypanosoma equiperdum* Infections in Rats of Different Age Groups.**—*Amer. Jl. Hyg.* 1939. Mar. Vol. 29. No. 2. Sect. C. pp. 73–77. [12 refs.]

It is believed that many of the well-known chemotherapeutic substances require for their action upon an invading parasite the intervention of the cells of the host body. As in previous work [see above] the author has found that the reticulo-endothelial system of young rats is less effective in affording the body definite resistance against infections with certain species of trypanosome than is that of older rats, it appeared worth while performing an experiment to determine the comparative efficacy of germanin in the treatment of experimental *T. equiperdum* infections in rats of different age groups.

It was found that in nursling rats the organisms generally persist for 30 to 36 hours after injection of the drug, whereas in older rats with an equal infection, the parasites disappear within 15 hours. It is concluded that the difference is probably related to a difference in the phagocytic capacities of the cells of the rats of different age groups.

W. Y.

CULBERTSON (James T.). **Transmission of Resistance against *Trypanosoma lewisi* from a Passively Immunized Mother Rat to Young nursing upon her.** [Research Notes.]—*Jl. Parasitology.* 1939. Apr. Vol. 25. No. 2. pp. 182–183.

The experiments described in this note show that a normal mother rat, passively immunized after delivery against *T. lewisi* by intraperitoneal injection of the serum of a specifically immunized rat, will afford resistance to young rats nursing upon her. It thus appears that the resistance naturally acquired by young rats from an immune mother is dependent upon the transfer to the young of an antibody identical with or similar to that found in the blood of the parent. *W. Y.*

CULBERTSON (James T.). **The Immunization of Rats of Different Age Groups against *Trypanosoma lewisi* by the Administration of Specific Antiserum per os.** [Research Notes.]—*Jl. Parasitology.* 1939. Apr. Vol. 25. No. 2. pp. 181–182.

In previous work the author showed [see above] that the young of a rat immune to *T. lewisi* are also resistant to this parasite, the resistance being acquired by the young largely after birth through the ingestion of the milk of the immune mother. The remarkable facility with which the young of all nursing ages acquired immunity led to an experiment to determine whether rats of different age groups could be protected against *T. lewisi* by the administration of a specific antiserum *per os*.

Rats of various ages, from 10 to 60 days, were given *per os* 0·5 cc. of specific antiserum per 10 gm. of body weight. The experiments showed that rats can be immunized against *T. lewisi* in this way throughout the usual nursing period (21 days), although late in this period with progressively less effectivity. Whether the intestine of older animals becomes impermeable to the antibody or develops the capacity to denaturize this antibody is, as yet, unknown. *W. Y.*

Culbertson (James T.). **Phagocytosis of Trypan Blue in Rats of Different Age Groups.**—*Arch. Pathology.* 1939. Feb. Vol. 27. No. 2. pp. 212–217. With 1 fig.

The work described in this paper was devised with the object of ascertaining whether the increased natural resistance against certain infections manifested by man and animals as they grow older may be related to an increasing reactivity of protective cells. It was hoped to find, through the use of trypan blue, whether the phagocytic function of these cells becomes more effective as the animals approach maturity.

In his experiments the author used a 1 per cent. suspension of trypan blue in distilled water on groups of rats 6, 10, 15, 18, 23, 40 and 60 days old, respectively. All the animals were kept on a standard diet; half of them received an intraperitoneal injection of 0·1 cc. of the suspension of trypan blue per 10 gm. of body weight, and the remainder twice this dose. Eighteen hours later all the rats were killed and the various tissues fixed and stained lightly with eosin.

Examination of the tissues revealed no significant difference in the phagocytic capacity of the cells of any of the organs of the various age groups, except the liver. In this organ, however, well-marked and constant differences were observed. Not only did more Kupffer cells in the liver of the older rats contain particles of the dye, but larger numbers of particles were found within each phagocytosing Kupffer cell of the older animals. These points are brought out in a table and in photographs. The conclusions are as follows:—

"There is a difference in capacity for phagocytic function between young and old rats, the Kupffer cells of nursling animals being less able to phagocytose particles of trypan blue than the Kupffer cells of older animals. This difference can be correlated with a gradually acquired resistance of rats against a natural blood flagellate (*Trypanosoma lewisi*) of this animal. It is suggested that the resistance which the rat naturally acquires against this parasite as it grows older is in part accounted for by a gradually acquired enhancement in the phagocytic capacity of the host's cells."

W. Y.

Mazza (Salvador) et al. Investigaciones sobre la enfermedad de Chagas. Gobernación Chaco. A. La enfermedad de Chagas en la gobernación del Chaco. [**Chagas' Disease; its Presence in the Chaco.**]—*Universidad Buenos Aires: Misión de Estudios de Patología Regional Argentina Jujuy.* 1939. Publicación No. 40. pp. 1–150. With 104 illustrations.

Dr. Mazza in an introductory article mentions 68 human acute cases of Chagas' disease seen in various parts of the Chaco and the finding of 184 *Triatoma infestans* positive among 506 collected from the houses. Of the 68 human patients, 7 were under 6 months of age, 11 between 1 and 2 years, 13 between 2 and 5 years, 12 between 5 and 10 years, and after that a progressive diminution with age; 44 were under 10 years.

In a series of eight papers, Dr. Mazza and his colleagues record cases seen in different parts of the Chaco country, all of them typical.

H. H. S.

Brumpt (E.). Faits expérimentaux et cliniques concernant le mode de transmission de la maladie de Chagas ou trypanosomose américaine. [**Experimental and Clinical Facts concerning the Method of Transmission of Chagas' Disease.**]—*C. R. Soc. Biol.* 1939. Vol. 130. No. 12. pp. 1197–1200.

It is now generally agreed that the usual mode of infection of the vertebrate with *T. cruzi* is by the infected excreta of the reduviid bugs. Various experiments have, however, from time to time been recorded suggesting that the bite of the bugs may sometimes be infective. Brumpt considers the criticisms which have been raised to such conclusions, and records more recent observations of his own.

During his recent visit to Mexico (1938) he isolated a number of strains of *T. cruzi*. One of these was virulent to mice : attempts to infect a young rat by the bite of 50 young nymphs, the dejecta of which were infective for rats of the same age, failed. Similar negative results were obtained in Brumpt's laboratory by Denecke and von Haller. *W. Y.*

Pifano (Félix). Anotaciones acerca del Psammolestes Arthuri ; Pinto 1926 (Hemiptera, heteróptera, triatomidae) : reduvideo hematófago encontrado en nidos de cucarachero de monte (probablemente Dendrocopaltidae) en un sector de los Valles del Yaracuy. Su importancia como posible vector en la naturaleza del Schizotripanum Cruzi, Chagas 1909. [*Psammolestes arthuri* **a Possible Natural Vector of** *Trypanosoma cruzi*.]—*Gac. Med. de Caracas*. 1938. Aug. 31. Vol. 45. No. 16. pp. 241–245. With 5 figs.

The author gives a very detailed description of a reduviid bug captured in the Yaracuy Valley, Venezuela, and identified as *Psammolestes arthuri* Pinto 1926. Up to the present it has not been found

Psammolestes arthuri Pinto, 1926.
Photograph of the insect together with a feather from its nest showing a deposit of its eggs.
[Reproduced from the *Gaceta Medica de Caracas*.]

outside Venezuela. Though it has not been found infected with *T. cruzi* in nature it readily became so when given infective feeds in the laboratory and is therefore at least a potential transmitter of Chagas' disease. *H. H. S.*

FERREIRA (L. de Castro) & DEANE (L.). Transmissão experimental do "Schizotrypanum cruzi" (Chagas, 1909) pelo "Clerada apicicornis" Signoret, 1863. Nota prévia. [**Experimental Transmission of *Trypanosoma cruzi* by *Clerada apicicornis***.]—*Brasil-Medico.* 1939. Feb. 4. Vol. 53. No. 6. p. 239.

The authors obtained a specimen of this Hemiptera and found its faeces free of flagellates. It was then permitted to feed on a camondongo experimentally infected with *T. cruzi* and examination of the faeces was made on alternate days thereafter. On the fourteenth day crithidia and metacyclic forms were seen, and these were emulsed in saline and injected into the peritoneum of a white rat. Thirteen days later its blood contained characteristic trypanosomes. The *Clerada apicicornis* is widely distributed in the Amazon estuary, and in the same area many animals are found naturally infected with the trypanosome. *H. H. S.*

DEANE (L.) & JANSEN (G.). Encontro de *Schizotrypanum cruzi* (Chagas, 1909) em marsupiaes da especie "Marmosa cinerea" Desmarest. [**Presence of *Trypanosoma cruzi* in *Marmosa cinerea***.]—*Brasil-Medico.* 1939. Feb. 11. Vol. 53. No. 7. pp. 265–266. With 4 figs.

Members of a Commission engaged in investigating visceral leishmaniasis in the State of Pará examined 40 specimens of *Marmosa cinerea*, a small opossum, and found *T. cruzi* in smears of spleen, liver, heart, lungs and bone marrow. By inoculating blood from these animals into three camondongos, a white rat, a guineapig, a dog and a *Macaca mulatta* infection was produced in all. One of the camondongos was killed 25 days later and trypanosomes were present, though few in number, in the blood, liver, spleen, bone-marrow, lungs and heart. *Triatoma brasiliensis* were allowed to feed on one of the camondongos, and 12–18 days later crithidial and metacyclic forms were found in the faeces of these insects. A specimen of *Clerada apicicornis* showed the same 10 days after a feed. *Marmosa cinerea* is thus another reservoir host, not previously mentioned, of *T. cruzi*. *H. H. S.*

TALICE (Rodolfo V.) & RIAL (Benito). Forma aguda de enfermedad de Chagas con síntomas faciales y sin puerta de entrada aparente. (Descripción del 20° caso uruguayo). [**A Case of Chagas' Disease without Recognizable Initial Lesion.**]—*Arch. Uruguayos de Med., Cirug. y Especialidades.* 1938. Nov. Vol. 13. No. 5. pp. 562–574. With 4 figs. [33 refs.]

Another case from Uruguay presenting typical symptoms, notably the early oedema of eyelids and dacryo-adenitis. In this case no portal of entry could be found, but in view of the early local signs it was probably present but was overlooked or had healed. *H. H. S.*

Kolodny (Maxwell H.). **Studies on Age Resistance against Trypanosome Infections : I. The Resistance of Rats of Different Ages to Infection with *Trypanosoma cruzi*.**—*Amer. Jl. Hyg.* 1939. Jan. Vol. 29. No. 1. Sect. C. pp. 13–24. [79 refs.]

The object of the investigation recorded in this paper was to study the development of an age resistance to infection with *T. cruzi* among rats of all ages from birth to senescence. It was found that the development with age of a non-specific type of resistance by the rat to *T. cruzi* is evidenced by the widely differing response of rats of various ages to infection. Young rats up to 20 days old are most susceptible. Slight resistance becomes demonstrable shortly after weaning (25 to 35 days), but a more marked resistance is observed at adolescence (40 to 50 days). The resistance reaches its maximum at full maturity and remains throughout the entire natural life of the animal.

The author believes that this age resistance is closely correlated with the normal physiological maturation and endocrine function of the host. There is no difference between male and female animals. The serum of resistant normal rats produced no effect upon the course of infection in immature susceptible rats ; and, consequently, the resistance of adult animals is not due to the presence of any specific antibody or non-specific factor in the serum. *W. Y.*

Kolodny (Maxwell H.). **Studies on Age Resistance against Trypanosome Infections. V. The Influence of the Age of the Rat upon Experimental Infection with *Trypanosoma cruzi* per os.**—*Amer. Jl. Hyg.* 1939. May. Vol. 29. No. 3. Sect. C. pp. 155–161. [14 refs.]

It was found that the age of the rat influences its susceptibility to infection *per os* with the blood forms of *T. cruzi*. Young nursling rats up to 12 days of age can be regularly infected by this route ; rats up to 20 days of age are occasionally susceptible, but older rats are consistently insusceptible. In animals orally infected, the infection is milder, more prolonged and less frequently fatal than in animals injected peritoneally. The infection is more severe in the very young animals orally infected than in slightly older animals infected by the same route. *W. Y.*

Kolodny (Maxwell H.). **Seasonal Variations in the Intensity of Experimental Infection with *Trypanosoma cruzi* in Young Rats.**—*Amer. Jl. Hyg.* 1939. May. Vol. 29. No. 3. Sect. C. pp. 131–133.

The author has observed that young albino rats up to 30 days of age suffer less intensive infection with *T. cruzi* during the summer months than during the fall, winter and early spring seasons. Reference is made to similar observations by other investigators upon seasonal variations in the susceptibility of guineapigs and mice to diphtheria toxin, encephalitis virus and rickettsia of endemic typhus. *W. Y.*

ROMAÑA (C.). Reproduction chez le singe de la "conjonctivite schizotrypanosomienne unilatérale. [**Reproduction in the Monkey of Unilateral Trypanosomal Conjunctivitis.**]—*Bull. Soc. Path. Exot.* 1939. Apr. 4. Vol. 32. No. 4. pp. 390–394. With 2 figs.

The author has reproduced in two monkeys the unilateral conjunctivitis, seen so commonly as an early sign of Chagas' disease, by depositing in the conjunctiva the infected faeces of *Rhodnius prolixus*. Signs appeared 10 days later, and the clinical syndrome was similar to that observed in human patients. *W. Y.*

RELAPSING FEVER AND OTHER SPIROCHAETOSES.

PRÉCIS OF ABSTRACTS IN THIS SECTION.

DELPY and RAFYI (p. 757) report on the presence of relapsing fever in Iran and state that the incidence is greater than has been generally believed. Clinically, the course is often long and the infection resistant to treatment. The spirochaete, *S. persica*, was studied and transmission experiments made with various species of tick. A suggested classification of the strains of relapsing fever spirochaetes is given, based on their behaviour in guineapigs. WHEELER (p. 758) records a total of 138 cases in California in the 17 years since the disease was discovered there; nearly all the infections occurred in June–September and nearly half the total in July. He gives an account of transmission experiments; it was rare (less than 2 per cent.) for the infection to pass through the egg to the larval stage of the tick, *O. hermsi*. Ticks might become infected directly by sucking the blood of other ticks. BONÉ (p. 759) by experiments with *O. moubata* on mice showed that the insect's salivary glands do not become infected. Injection of the faeces also failed to convey the disease; the infecting agent is considered to be the coxal fluid. The same author offers further experimental evidence that *S. duttoni* can penetrate the barrier between the haemocoele and the coxal glands and appear in the coxal fluid, whereas foreign corpuscles, bacteria, etc., do not. He tested the hereditary transmission of the same spirochaete by *O. moubata*; the results varied but on the whole tended to support the view that infection is transmitted to the next generation by spirochaetes *as such*. Duration of infectivity of *O. turicata* was investigated by FRANCIS (p. 760). He found that Texan relapsing fever was transmitted by their bite after starvation for 5 years, and by others which had been fed once only in 6½ years. The coxal fluid was not infective. Hereditary transmission via eggs of infected ticks was observed. The Texan strain in man did not respond to neoarsphenamine. Bedbugs, after feeding on infected patients, themselves infected mice which ingested these insects.

KIRK (p. 761) made a laboratory study, by cultivation and animal inoculation, of a louse-transmitted spirochaete from Abyssinia. Attempts to infect ticks, especially *O. savignyi*, with this strain were completely unsuccessful, although this tick is an important vector in Abyssinia. CHUNG and WEI (p. 763) investigated the mechanism of transmission of relapsing fever by the louse to a general paralytic

subjected to pyretotherapy. The authors' findings support the view that the bodies of the insects are infective whereas their bite is not. Morisita (p. 763) found that the rat-mite, Liponyssus, would retain infection with spirochaetes for 7 days, but that it does not transmit it by the bite, nor is the infection passed to the next generation.

Chung and Chang (p. 763) studied clinically 337 patients in the Peiping Hospital between 1921–37. Males greatly preponderated, 6 to 1 in corrected figures. The disease occurs in the district all the year round, but the incidence rises from December to reach a climax in April. A detailed analysis of the symptoms is given. Digonnet and Mathis (p. 765) describe the case of a woman two months pregnant infected by relapsing fever (tick-borne) ; in spite of threatened abortion pregnancy went to term. A method for facilitating diagnosis is described by Simons (p. 765) by which, in the case of blood, the cells are dissolved out by a haemolytic system, and in the case of tissues by a cytolytic agent. He recommends 10 per cent. sodium taurocholate with methylene blue, whereby the spirochaetes are stained and so, though few in number, are easily seen.

Lodewyckx (p. 766) notes the increase of cells, lymphocytes mainly, together with increase of pressure in the cerebrospinal fluid of African relapsing fever patients. Meningeal symptoms are far from uncommon in African relapsing fever—a fact to be borne in mind in regions where trypanosomiasis exists.

Di Benedetto (p. 766) gives a clinical review of 193 cases of relapsing fever observed in Italian East Africa, but does not mention whether the vector in this district is a louse or a tick. In speaking of treatment arsenicals seem to be essential for success, though he regards their combination with auxiliaries such as insulin, and liver extract, as more beneficial than the first alone. Figures to support his thesis are not, however, given.

Hawking (p. 767) has tested the reaction of strains of relapsing fever spirochaetes to chemicals—arsenic, antimony, gold, and acriflavine preparations—using methods previously employed with trypanosomes. Details are given in a table. The work of André Sergent (p. 768) on relapsing fever in Algeria has already been referred to [this *Bulletin*, 1939, Vol. 36, p. 108] ; the article noted here is an " In Memoriam " issue. *H. H. S.*

Delpy (L.) & Rafyi (A.). Sur la fièvre récurrente sporadique en Iran. Contribution à l'étude expérimentale de *Spirochaeta persica* Dschunkowsky, 1913. [**Sporadic Relapsing Fever in Iran. A Contribution to the Experimental Study of** *Spirochaeta persica*. **Dschunkowsky, 1913.**]—*Ann. Parasit. Humaine et Comparée.* 1939. Jan. 1. Vol. 17. No. 1. pp. 45–61. With 1 chart & 3 figs.

The authors mention the frequent occurrence of cases of persistent and irregular fever, resistant to quinine, occurring in the region to the East of Teheran. During the summer of 1937, whilst examining only people more or less attached to the laboratory, 5 of such cases were found to be typical infections of relapsing fever, which suggests that the disease is much more common in Iran than was previously supposed.

All these 5 cases occurred in the village of Hessarek and all the patients had been exposed to the bites of *Ornithodorus tholozani* (*O. papillipes*). The course of the disease is long and often serious.

One of the patients had four febrile attacks in 17 days and a fifth 13 days later. After being under observation for 45 days, the blood of this patient was still infective to rabbits. Two of the cases responded to treatment with novarsenobenzol, but in two others the course of the disease seemed to be unaffected.

An experimental study was made of the spirochaete, *S. persica*, isolated from these cases. The results of inoculation experiments show that rats and rabbits are quite as susceptible to infection as guineapigs. Splenectomized dogs are rather less susceptible, also sheep, and in the latter species spirochaetes were never seen in the blood. The brain remained infective up to 268 days in the case of the rat, 24 to 25 days in dogs and 8 to 73 days in sheep. In the rat the incubation period may be as long as 20 days, double that in the guineapig, but otherwise the infection follows the same course as in guineapigs and rabbits.

Three rabbits and a guineapig that had recovered from infection 2 to 7½ months previously were found to be immune against reinfection.

Transmission experiments were made with *Ornithodorus tholozani*, *O. lahorensis* and *Hyalomma dromedarii*, which were allowed to feed on infected animals and subsequently the following stage fed on normal animals. *O. lahorensis* and *H. dromedarii* gave negative results, but in the case of *O. tholozani* a nymph infected after the first moult produced infection by its bite 116 days later, and in the adult stage a second infection after 458 days. A female tick infected a rabbit by its bite, 371 days after feeding on an infected rat; and after 328 days it had laid eggs from which hatched infected larvae.

The authors conclude with a general discussion on the various strains of relapsing fever spirochaetes occurring in Central Asia, and classify them as follows, according to their behaviour in guineapigs.

A. Strains highly pathogenic to guineapigs, often fatal, with splenomegaly even to rupture of the spleen.
   (*a*) *S. usbekistanica* Pikoul 1928. (Mortality 100 per cent.).
   (*b*) Strain Stalinbad. Pavlowsky and Brumpt 1934. (Mortality 71 per cent. with haemoperitoneum.)
   (*c*) Strains S5 and S11. Adler *et al*, 1937. Mortality 37 & 46 per cent., splenomegaly and frequent rupture of the spleen.

B. Strains producing a more or less intense blood infection, but without any appreciable symptoms or lesions, and ending in recovery.
   (*a*) Schachrijsjabz Strain, Moskwine, 1927–28.
   (*b*) *S. sogdianum* Nicolle and Anderson 1928.
   (*c*) *S. persica* Dschunkowsky 1913; which probably includes the two other strains, *a* and *b*, assigned to this group.

E. Hindle.

WHEELER (Charles M.). **Relapsing Fever in California. Attempts to transmit Spirochaetes of California Relapsing Fever to Human Subjects by Means of the Bite of the Vector,** *Ornithodoros hermsi* **Wheeler.**—*Amer. Jl. Trop. Med.* 1938. Nov. Vol. 18. No. 6. pp. 641–659. With 1 map, 3 figs. & 1 plate. [12 refs.]

A summary of the case distribution of relapsing fever in California since its discovery in 1921 up to 1937, together with an account of transmission experiments with its vector, *Ornithodorus hermsi*.

A total of 138 cases of infection have been recorded which nearly all occurred between June and September, July being the month with most cases (62).

The infection has been transmitted to white mice, monkeys and human subjects by the bites of infected ticks, and it has been shown that the infection passes through the egg to the larva in less than 2 per cent. of about 600 tested. Seven rhesus monkeys were exposed to the bites of 17 infected ticks, but only one monkey developed the infection, spirochaetes appearing after an incubation period of 16 days. During these experiments no faeces or coxal fluid were excreted by the ticks whilst feeding, and therefore the infection must have been introduced by means of the mouth parts, presumably from the salivary glands. It was also noted that in nature ticks sometimes suck blood from other ticks, and in this way infection might be transmitted from one tick to another without the presence of a mammalian host.

Seven human subjects were exposed to the bites of infected ticks and one of them, bitten by 2 adults, developed the disease after an incubation period of 7 days and showed three febrile attacks, spirochaetes being found in the first two of them. Although this patient had received a systematic treatment with neosalvarsan, bismuth and tryparsamide, for nearly 17 months, this did not seem to alter the course of the infection with relapsing fever. *E. H.*

Boné (G.). Mode de transmission du spirochète de Dutton par les Ornithodores *moubata*. [**The Method of Transmission of** *Spirochaeta duttoni* **by** *Ornithodorus moubata*.]—*C. R. Soc. Biol.* 1938. Vol. 129. No. 32. pp. 901–903.

The author has fed on various mice 337 nymphs infected both hereditarily and by feeding on infected blood, and also 10 adults of *Ornithodorus moubata*, without ever producing infection with *Spirochaeta duttoni*. It is concluded, therefore, that the salivary glands do not become infected. Negative results were also obtained by the injection of the tick's faeces, and the author considers that the coxal fluid alone is responsible for the production of infection. *E. H.*

Boné (G.). L'infection des Ornithodores *moubata* par le spirochète de Dutton. [**The Infection of** *Ornithodorus moubata* **with** *Spirochaeta duttoni*.]—*C. R. Soc. Biol.* 1938. Vol. 129. No. 32. pp. 903–905.

The author has made dark ground examinations of the contents of *O. moubata* fed on mice infected with *S. duttoni*. The spirochaetes were found to enter the coelomic fluid and there multiply by simple fission. It was also noted that when ticks became fully engorged the spirochaetes entered the coelomic fluid much more readily than in ticks only partially engorged. Also an increase in the number of spirochaetes in this fluid was noted when infected ticks were fed on normal mice, which is supposed to be due to the liberation of spirochaetes from the wall of the gut as a result of the passage of fluid from the newly ingested blood.

Ticks were infected artificially by the injection of spirochaetes into their coelomic cavity and showed the multiplication of these organisms, and the coxal fluid became infective. Also the same augmentation in numbers was observed when they were fed on normal mice.

The author is of the opinion that his observations are in favour of a simple multiplication of the spirochaete in the body of the tick, without any other cycle of development. *E. H.*

Boné (Georges). L'excrétion des spirochètes de Dutton chez *Ornithodorus moubata*. [**The Excretion of** *Spirochaeta duttoni* **in** *Ornithodorus moubata*.]—*C. R. Soc. Biol.* 1939. Vol. 130. No. 1. pp. 84–85.

A continuation of a previous note on the subject. [See above.] The author has now investigated the problem of the presence of spirochaetes in the coxal fluid of infected *Ornithodorus*.

Suspensions of sheep red cells, of bacteria, or of spirochaetes, were injected into the haemocoele of different ticks and in some instances coxal fluid was emitted whilst the tick was being injected. In other cases the ticks were afterwards fed on mice and the coxal fluid collected.

In both groups, spirochaetes were the only elements to appear in the coxal fluid, showing that there is a barrier between the haemocoele and the coxal glands. Consequently the spirochaetes must penetrate through this barrier in order to get into the cavity of the coxal glands.

E. H.

Boné (G.). La transmission héréditaire du spirochète de Dutton chez *Ornithodorus moubata*. [**The Hereditary Transmission of** *Spirochaeta duttoni* **in** *Ornithodorus moubata*.]—*C. R. Soc. Biol.* 1939. Vol. 130. No. 1. pp. 86–87.

The author has examined the contents of eggs laid by *Ornithodorus moubata* fed on mice infected with *Spirochaeta duttoni*. In one case 40 eggs were examined without finding a single spirochaete, but in a second experiment 3 females laid eggs which all contained spirochaetes. In a third experiment these same females laid eggs in which spirochaetes could not be found. In view of the fact that some of the eggs contain spirochaetes the author assumes that in ticks the infection is transmitted to the next generation by spirochaetes as such, and not by any other stage.

Only 2 out of 7 mice injected with 5 to 100 of these eggs became infected, which the author considers may have been the result of the virulence of the spirochaetes being attenuated, or of their being affected by the coating of egg substance. *E. H.*

Francis (Edward). **Longevity of the Tick** *Ornithodoros turicata* **and of** *Spirochaeta recurrentis* **within this Tick.**—*Public Health Rep.* 1938. Dec. 23. Vol. 53. No. 51. pp. 2220–2241. With 3 charts & 9 figs. (6 on 3 plates). [20 refs.]

A valuable summary of laboratory observations extending over 7 years upon 119 naturally infected *Ornithodorus turicata* collected in caves in Texas in 1931, and upon the survival of relapsing fever spirochaetes within these ticks for 6½ years.

The ticks were collected from caves and overhanging ledges in various parts of Texas and usually occurred in powdery dust or sand. All were fed on arrival in 1931, on two normal rhesus monkeys, both of which became infected with relapsing fever. These ticks were kept in a corner of the laboratory in Washington from which steam heat

was excluded. Of the original 119 ticks, 64 survived starvation for 3 years, 35 for 4 years and 13 for 5 years. They were tested as follows :

12 ticks starved 3 years infected a monkey and became group A.
11 „ „ 4 „ „ „ „ „ „ B.
13 „ „ 5 „ „ „ „ „ „ C.
5 group A ticks fed once in 6 years failed to infect.
5 „ B „ „ „ 6½ years infected a monkey.

Hereditary transmission of the infection to the next generation of ticks was obtained through eggs from naturally infected ticks and also from those artificially infected.

Bed bugs, *Cimex lectularius*, if fed on blood containing spirochaetes were found to produce infection in 4 out of 8 mice which ingested these bugs. White mice readily attack and eat bed bugs, therefore this is a way in which the infection might be transmitted. Eight lots of bugs also ingested blood containing *Spirillum minus* and were subsequently eaten by mice but none of them showed any signs of infection. Negative results were also obtained in attempts to infect mice by feeding them with lice, *Pedicinus longiceps*, collected from infected monkeys. Although spirochaetes were not found in monkey lice during their first 16 days of subsistence on an infected monkey, they were demonstrated daily after the 17th day, but these infected lice failed to infect a monkey on which 1,550 of them were liberated.

Various observations were made on the biology and life history of *O. turicata*. Spirochaetes were never found in the coxal fluid of infected ticks when examined by dark field, and white mice inoculated with the fluid remained negative. The ticks are very resistant to moisture and continuous immersion in distilled water for a week had no ill effects.

Rhesus monkeys were found to be very susceptible to this relapsing fever, and the incubation period averaged 4⅜ days for the first appearance of spirochaetes in the blood and 5⅜ days to the first onset of fever. Two monkeys out of eight succumbed to the disease and those which recovered did not show immunity to second attacks, 9 months to a year after the original infection.

The author includes useful observations on the methods of feeding ticks on animals.

Finally it is noted that neoarsphenamine failed to show any specific therapeutic value in three human cases infected with this Texas strain of relapsing fever. *E. H.*

KIRK (R.). **A Laboratory Study of Abyssinian Louse-borne Relapsing Fever.**—*Ann. Trop. Med. & Parasit.* 1938. Dec. 21. Vol. 32. No. 4. pp. 339–356. With 1 text fig. & 4 figs. on 1 plate. [39 refs.]

An interesting laboratory study of a strain of relapsing fever of Abyssinian origin, isolated from cases occurring in the Sudan, in which the louse was incriminated as the vector.

The length of the spirochaetes was found to average 18μ. Attempts to culture them on Yuan-Po's and many other media gave completely negative results, but excellent cultures were obtained in a modified Noguchi medium prepared as follows :—Under sterile conditions half-an-inch of egg albumen was pipetted into 5″×¼″ test-tubes, and then coagulated at 80°C. Then the tubes were filled to within 1½″ from the top with fresh ascitic fluid. The tubes were inoculated with

3–5 drops of blood containing spirochaetes and incubated at 37°C. The organisms grew very rapidly and subcultures were made every 2–4 days. One strain was passed through 12 subcultures without any diminution in virulence.

White rats, rabbits, guineapigs and the ordinary black and brown wild rats were all insusceptible, but white mice were readily infected from human cases, spirochaetes appearing 12–24 hours after inoculation, always present after 48 hours, and generally disappearing on the third day. Gerbilles were also susceptible.

Subinoculations from mouse to mouse were unsuccessful and passage through monkeys did not enhance the virulence.

The common grey monkey of the Sudan (*Cercopithecus sabaeus*) was susceptible, and usually showed one relapse, resembling the course in human beings. The strain was maintained in these animals for three passages. Spirochaetes were found in the haemocele fluid of lice from infected persons, and a monkey was infected by rubbing some of the contents of a single louse on to the shaved abdomen of a splenectomized animal. This monkey died 12 days later with its blood swarming with spirochaetes, and was the only one to die in the first paroxysm of relapsing fever ; it is suggested that the disease acquired from the louse is more virulent than that produced by blood inoculation.

Evidence of immunity was found in infected animals, but several antigenic variants were present. In monkeys splenectomy was found to influence the course of the first infection, but had no effect on acquired immunity. In mice, splenectomy had no effect, probably owing to the fact that with very mild infections, the reserves of the reticulo-endothelial system are sufficient to mask any effects of splenectomy.

No evidence of latent or residual infections was found in mice and gerbilles after recovery.

The Abyssinian strain of relapsing fever evidently resembles in its general features other members of the North African group of louse-borne strains. *E. H.*

KIRK (R.). **The Non-Transmission of Abyssinian Louse-borne Relapsing Fever by the Tick *Ornithodorus savignyi* and Certain Other Blood-sucking Arthropods.**—*Ann. Trop. Med. & Parasit.* 1938. Dec. 21. Vol. 32. No. 4. pp. 357–365. [34 refs.]

A record of experiments with an Abyssinian strain of louse-borne relapsing fever [see above p. 761] to determine whether it could be transmitted by other blood-sucking Arthropods.

Special attention was paid to the possibility of *Ornithodorus savignyi* as it has been cited as an important vector of relapsing fever in Abyssinia. The ticks were allowed to feed on either infected persons or animals, and then after varying periods attempts were made to infect susceptible animals by the bite of these ticks, by the inoculation of coxal fluid, and finally by the inoculation of their total contents. The results of these experiments were entirely negative, and in addition spirochaetes were never found by dark ground examination of the coxal fluid or in stained smears of the contents of the ticks. A single experiment with *Argus persicus* with six weeks interval between the infective meal and the inoculation of the ticks' contents into mice, also gave negative results.

The examination of lice, Pedicinus, found on infected monkeys showed the presence of abundant spirochaetes in smears of the lice, even when no blood cells were noticed, but all attempts to produce infection by the inoculation of the contents of these lice into a splenectomized monkey and gerbilles were uniformly negative.

E. H.

Chung (Huei-Lan) & Wei (Yü-Lin). **Studies on the Transmission of Relapsing Fever in North China. II. Observations on the Mechanism of Transmission of Relapsing Fever in Man.**—*Amer. Jl. Trop. Med.* 1938. Nov. Vol. 18. No. 6. pp. 661–674. With 2 figs. [13 refs.]

A record of experiments on the transmission of the Chinese strain of *Spirochaeta recurrentis* performed on 6 normal subjects and 4 patients with general paralysis of the insane.

Five subjects were exposed to the bites of large numbers of human lice which were known to be infected with the spirochaete, but no signs of infection were observed. When four lice, infected 12 days previously, were ground up in saline, and this emulsion was placed on the skin of the forearm of a man who had just been bitten in the same place by normal lice, this patient became infected with relapsing fever after 11 days' incubation period. Similar positive results were obtained by the introduction of the contents of body lice into the conjunctiva, in two out of three patients exposed to infection, the incubation period being 8 days.

Various attempts to infect patients by placing the contents of infected lice in the mouth gave uniformly negative results. In one experiment the faeces of 100 lice, collected daily 7 to 12 days after an infective feed, were instilled on to the excoriated skin of a volunteer, but no fever was observed during six weeks.

The results of these experiments support the view that the bites of infected lice are innocuous, and that the disease is contracted through crushing infected lice on the skin or introducing the infective material on to the conjunctivae. *E. H.*

Morisita (T.). **Transmission Experiments on Relapsing Fever with Tropical Rat-Mite,** *Liponyssus sp.*—*Japanese Jl. Experim. Med.* 1938. Dec. 20. Vol. 16. No. 6. pp. 551–558.

The author found that mites (Liponyssus sp.) collected from mice infected with spirochaetal relapsing fever [strain not stated], retained the infection up to seven days. Transmission was never obtained by the bites of these mites, but only by the inoculation of the ground-up contents. Moreover, the eggs and larvae from these mites never contained spirochaetes. *E. H.*

Chung (Hui-Lan) & Chang (F. C.). **Relapsing Fever. Clinical and Statistical Study of 337 Cases.**—*Chinese Med. Jl.* 1939. Jan. Vol. 55. No. 1. pp. 6–33. With 3 charts. [16 refs.]

A useful clinical and statistical study of 337 in-patients suffering from relapsing fever observed in the Peiping Union Medical College Hospital from 1921 to 1937. In every instance the diagnosis was confirmed by finding *Spirochaeta recurrentis* in the blood.

The sex distribution was 1 female to 17 males, and even after correction for ratio of admissions, was 1 female to 6 males, probably owing to the fact that most of the patients contracted the disease in army camps, poor-houses and small inns where the population was exclusively male.

The disease is endemo-epidemic in Peiping and occurs in all months of the year. The incidence is lowest in autumn, begins to rise in December and reaches its climax in April and May, after which it declines.

The symptoms of these 337 patients are given in the following table :

Symptoms	No. of cases	Percent.	Symptoms	No. of cases	Percent.
Sudden onset ...	307	91·5	Sweating ...	92	27·3
Fever	326	96·8	Scanty urination	85	25·2
Headache or dizziness	257	76·2	Abdominal pain	64	19·0
Chills or chilliness	245	72·7	Thirst	60	17·8
Anorexia ...	233	69·2	Auditory disturbance	47	14·0
General aching	198	58·8	Diarrhoea ...	47	14·0
Constipation ...	159	47·4	Visual disturbance	35	10·4
Cough	139	41·2	Epigastric pain	32	9·5
Prostration ...	124	36·8	Chest pain ...	16	4·8
Nausea	100	29·7	Melaena ...	5	1·5
Vomiting ...	98	29·1	Convulsion ...	2	0·6
Epistaxis ...	92	27·3	Haematemesis ...	1	0·3

In most cases the incubation period was 5 to 11 days. The onset was generally sudden, the first symptoms being fever, chilliness, headache and pain in muscles and bones, associated with anorexia. The number of febrile attacks without treatment seems to be 3 to 5, and the duration of each varies from 4 to 10 days with an average of 7 days. In 74 patients the first remission varied from 3 to 16 days, the average being 7·1 days.

Splenomegaly was observed in 69·2 per cent. and enlargement of the liver in 40·7 per cent. of the patients. Jaundice occurred in 29·4 per cent., haemorrhagic skin rash in 34·7 per cent., general glandular enlargement in 18 per cent. ; some patients had cerebral symptoms. Pneumonia occurred in 5 per cent. and was a very serious complication, accounting for 8 out of 21 deaths in this series.

The blood was examined in each patient. Only 60 per cent. showed leucocytosis varying from a slight to a marked degree. The erythrocyte count showed anaemia with counts varying from 1 to 3·9 million in 31·7 per cent. of the cases. The haemoglobin content was low but not severely so in most instances.

Slight albuminuria occurred in 195 cases, of which 97 showed casts and 34 haematuria.

The patients were generally treated as soon as spirochaetes were found in the blood, by injections of neoarsphenamine. The average time for the disappearance of spirochaetes was 15½ hours after treatment, and out of 281 treated cases 16 required a second treatment. The dose was usually 10 mgm. per kilo body weight. Finally the author

gives a list of the complications and associated conditions in these relapsing fever patients, the most common being syphilis, opium addiction and scabies. *E. H.*

DIGONNET (L.) & MATHIS (Maurice). Spirochétose récurrente africaine à tiques évoluant chez une femme enceinte. [**Tick-transmitted African Relapsing Fever developing in a Pregnant Woman.**]—*Bull. Soc. Path. Exot.* 1939. Feb. 8. Vol. 32. No. 2. pp. 143–145.

The description of a case of relapsing fever in a woman at Dakar infected by the bites of *Ornithodorus erraticus* during the second month of pregnancy who, in spite of two relapses and various signs suggestive of abortion or premature delivery, completed the gestation and gave birth to a normal infant.

The patient received, without any apparent inconvenience, 2·10 gm. of sulpharsenobenzol intramuscularly and 4·5 gm. of tryparsamide intravenously. At birth the blood from the umbilical cord was inoculated into rats with negative results.

The authors consider that the early treatment was largely responsible for the favourable course of the disease and of the pregnancy.

E. H.

SIMONS (H.). Nouvelle méthode d'enrichissement pour certains spirochètes sanguicoles au moyen de taurocholate de bleu de méthylène. [**A New Method of concentrating Certain Blood Spirochaetes by Means of Taurocholate of Methylene Blue.**]—*Ann. Parasit. Humaine et Comparée.* 1939. Jan. 1. Vol. 17. No. 1. pp. 62–68. [10 refs.]

The author has developed a system first recommended by HOEFER (1919), for the diagnosis of certain protozoal infections, of exposing 10 cc. or more of the blood or other material to be examined to a haemolytic system which will dissolve the blood elements but leave the parasites.

It has been generally believed that 10 per cent. sodium taurocholate dissolved spirochaetes, but the author finds that *S. gallinarum*, *S. duttoni*, *S. persica* and *S. turicatae* persist for several weeks in such a solution, although *S. pallida* and *S. icterohaemorrhagiae* are rapidly attacked. Accordingly a technique has been developed for the examination of spirochaetes in blood and other tissues employing this cytolytic agent. 2 cc. of 10 per cent. sodium taurocholate dissolved in sodium citrate solution or physiological saline, is mixed with 1 cc. of saturated methylene blue dissolved in saline. This mixture will keep for about one month if preserved in a well corked bottle, preferably in the ice chest.

For the examination of blood containing moderate numbers of spirochaetes, 2 to 4 loopfuls of the taurocholate and stain are mixed on a slide with an equal quantity of the infected blood. After a few seconds the drop is covered and can be examined by direct illumination when almost all traces of the blood cells will be found to have disappeared and the spirochaetes, coloured blue, are readily seen.

If very few spirochaetes are present, it is possible to collect together all the material left on the slide, as the organisms are entangled in a coagulum and all cellular elements disappear. In this way one can

concentrate and examine the remains of relatively large quantities of blood and detect spirochaetes even when they are rare.

For the examination of larger quantities, 2 cc. of the blood are mixed with 1 cc. of sodium citrate solution and 0·5 cc. of the taurocholate mixture, and strongly centrifuged for 2 minutes. The clear supernatant fluid is then removed and the sediment, containing any spirochaetes, examined by dark ground.

Cerebrospinal fluid and urine can also be examined by the use of these methods. In the case of tissues it is necessary to cut them up into small pieces, wash in saline to remove blood and then to break up the tissue in the cytolytic mixture on the slide by means of needles.

For the examination of bile, an equal part is mixed with the taurocholate methylene blue, the mixture strongly centrifuged for 5 minutes, and the sediment examined for spirochaetes. A peculiar photodynamic effect was observed in spirochaetes stained in this way. When exposed for an hour or more to direct light, the blue colour remained unchanged, but when the same spirochaetes were exposed for 5–20 minutes to dark ground illumination, the spirochaetes became irreversibly decolourized.

E. H.

Lodewyckx (A.). Note sur les altérations du liquide céphalorachidien en rapport avec la fièvre récurrente africaine. [**Note on the Alterations of the Cerebrospinal Fluid accompanying African Relapsing Fever.**]—*Ann. Soc. Belge de Méd. Trop.* 1938. Sept. 30. Vol. 18. No. 3. pp. 487–496.

A record of observations at Kigali on the cerebrospinal fluid of 27 cases of African relapsing fever (*S. duttoni*). In 8 cases the fluid was normal, but 2 of these showed changes later on, whilst the other 19 cases all showed a leucocytosis, usually an increase of lymphocytes. In three instances spirochaetes were found by direct examination. The alterations in the fluid were most marked and constant in relapses after insufficient or ineffective treatment. An increase in pressure was observed in 15 cases and lumbar puncture, by relieving the pressure, was usually followed by an improvement in the condition of the patients.

Two patients were treated with good results by injections of May and Baker's Crisalbine (sodium aurothiosulphate), after neosalvarsan had been used without any result. In both these patients the injections were followed by a fall in temperature, the disappearance of symptoms and there were no relapses.

The author calls attention to the frequency of meningeal symptoms in cases of African relapsing fever, a fact which should be borne in mind in regions where trypanosomiasis may also be present.

E. H.

Di Benedetto (Vincenzo). Note di clinica e di terapia della febbre ricorrente africana. [**African Relapsing Fever, Clinical and Therapeutic Notes.**]—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1939. Mar. Vol. 20. No. 3. pp. 168–172.

In a series of 193 cases of relapsing fever diagnosed in Italian East Africa the author found enlargement of spleen and liver in each, even in the first febrile periods. In the later relapses hepato-splenomegaly with tenderness was marked. Most of the patients were

slightly jaundiced and in the majority there was albuminuria, with glycosuria in 85 per cent. Spirochaetes were constantly found in the febrile periods.

In treatment the author advises large doses of arsenobenzol, 0·6 gm. intravenously, from the beginning. Subsidiary treatments, tried in a few cases, were 10 units of insulin followed by the ingestion of 50 gm. sugar, and liver extract. These were combined with the arsenobenzol therapy. The results of these combined treatments are described as flattering, but figures are not given. *C. W.*

HAWKING (Frank). **The Chemotherapeutic Reactions of Relapsing Fever Spirochaetes** *in Vitro.—Ann. Trop. Med. & Parasit.* 1939. Mar. 31. Vol. 33. No. 1. pp. 1–11. With 1 fig.

A study of the chemotherapeutic reactions of a strain of relapsing fever spirochaetes of unknown origin, examined *in vitro* by the methods previously used for trypanosomes.

The strain of spirochaetes used was supplied by Professor Schlossberger, of Berlin, and was said to be more sensitive to arsenicals than other strains in his possession but not capable of infecting man. It produced heavy infections in mice but developed poorly in rats. Thirteen compounds were used in these experiments, including arsenic, antimony and gold preparations and diamino-methyl-acridine, the chief component of "acriflavine."

For comparison a solganal-resistant strain of spirochaete was prepared by exposing the parasites to the compound *in vivo*. After 12 passages in mice the minimum effective dose of solganal had increased from 0·5 mgm. per 20 gm. mouse to about 1·0 mgm.; after 21 passages to 2·0 mgm.; after 42 to 4 mgm.; and after 61 to 6·0 mgm. It was found much more difficult to obtain drug-resistant strains of spirochaetes than of trypanosomes.

When testing the action of drugs *in vitro*, the spirochaetes were obtained from the blood of infected mice, separated by centrifuging and added to tubes containing a medium consisting of 2 parts Locke's solution, together with 0·2 per cent. glucose and 1 part of rabbit serum inactivated by heating to 60°C. for one hour. The initial number of spirochaetes was usually about 100 per 20 fields using a $\frac{1}{6}$ objective and no. 4 ocular.

The results are summarized in the table on the following page.

It is evident that there is an approximate parallelism between the activity of organic trivalent arsenical compounds and of diamino-methyl-acridine upon spirochaetes and upon trypanosomes (*T. rhodesiense*), the minimum lethal concentration *in vitro* for spirochaetes being about 20 times as great as that for trypanosomes. But the spirochaetes are relatively more sensitive to reduced stovarsol and to parosan oxide (8-acetamino-3-oxo-1, 4 benzisoxazin-6-arsenoxide), and are insensitive to sodium arsenite and to tartar emetic.

Solganal has little action on spirochaetes or trypanosomes *in vitro* and cannot be activated by the addition of lysed red blood corpuscles. Spirochaetes tend to absorb organic trivalent arsenical compounds when exposed to them *in vitro*, but the amount absorbed is very much less than is the case with trypanosomes. Spirochaetes exposed to diamino-methyl-acridine become photosensitive and in this respect there was no appreciable difference between the behaviour of normal

TABLE

Showing the minimum lethal concentration in vitro *at 37°C. of various compounds for normal and solganal-fast strains of spirochaetes and for normal trypanosomes.*

Drug	Minimum lethal concentration : γ per ml.						Ratio between trypanocidal and spirochaeticidal activity
	Normal spirochaetes		Resistant spirochaetes		Trypanosomes		
	Within 6 hours	Within 24 hours	Within 6 hours	Within 24 hours	Within 6 hours	Within 24 hours	
Reduced tryparsamide	0·6	0·16	1·2	0·3	0·04	0·008	15–20
Phenyl-arsenoxide ...	0·13	0·06	—	—	0·003	0·002	30–40
Reduced stovarsol ...	0·5	0·2	—	—	0·5	0·07	1–3
Reduced orsanine ...	0·3	0·16	—	—	0·03	0·007	10–20
Reduced neocryl ...	0·8	0·16	—	—	0·06	0·007	15–20
K.352	0·9	0·2	—	—	0·03	0·01	20–30
Parosan oxide ...	2·5	0·3	—	—	1·2	0·3	1–2
P-carboxy-phenyl dichlorarsine	7·0	2·5	—	—	7·0	0·8	1–3
Novarsenobillon ...	0·6	0·3	1·25	0·6	0·08	0·02	8–15
Arsenious oxide ...	160·0	80·0	160·0	80·0	1·0	0·3	160–270
Tartar emetic	250·0	200·0	250·0	200·0	0·5	0·16	500–1,200
Diamino-methyl-acridine	1·25	0·5	1·25	0·5	0·15	0·02	8–25
Solganal	90·0	50·0	90·0	50·0	500·0	50·0	0·2–1

and solganal-resistant strains, but the resistance of the strain to this drug never became complete, even after 70 passages.

E. H.

SERGENT (André). (In Memoriam.) La fièvre récurrente hispano-nord-africaine en Algérie. [**Spanish-North-African Relapsing Fever in Algeria.**]—*Arch. Inst. Pasteur d'Algérie.* 1938. Dec. Vol. 16. No. 4. pp. 403–450. With 19 figs. (2 on 1 plate). [17 refs.]

[See this *Bulletin*, 1939, Vol. 36, p. 108.]

LEPTOSPIROSIS.

PRÉCIS OF ABSTRACTS IN THIS SECTION.

BESSEMANS and his co-workers (p. 769) deduce, from examination of urine and the results of serological tests of dogs and of a few suspicious cases of jaundice in man, that leptospiral infections are rare occurrences in Belgium. In Dalmatia, on the contrary, TARTAGLIA (p. 769) proved its presence in eleven agriculturists and fishermen, and found also that in certain districts in the environs of Metkovic up to 20 per cent. of the rats examined were harbouring the organism. MONTESTRUC and his colleagues (p. 770) describe two cases in Martinique, one ending fatally; these are believed to be the first recorded in the island. The succeeding four papers abstracted deal mainly with the clinical aspect. SJÖBERG of Sweden (p.770) relates three fatal cases, in one of which death took place on the eighth day of illness. Though these

three occurred in separate years the author is of opinion that the disease is not very rare in that country. DENÉCHAU and MANDROUX (p. 771) mention a case with an incubation period of 17 days; the patient recovered after an illness of 13 days, during which he exhibited meningeal symptoms, but, strange to say, no jaundice. The next two also describe meningeal symptoms: MURGATROYD's record (p. 771) is of a very chronic case in which the leptospira was recovered from the cerebrospinal fluid up to eight months after the onset of illness. In ESCHBACH's patient (p. 771), in addition to the symptoms of encephalomyelitis, there was a cutaneous eruption with adenitis. [It seems to be taken for granted that all these were aetiologically connected with the leptospiral infection.]

CARLINFANTI (p. 771) has studied the antigenic properties of *Leptospira icterohaemorrhagiae*, employing alcoholic extracts of various strains, and suggests that the reaction which occurs between syphilitic sera and leptospiral lipids may be due to a common alcohol-soluble partial antigen. MORROW and his fellow-workers (p. 772) describe the cultivation of *L. icterohaemorrhagiae* on fowl embryo chorio-allantoic membrane, and PAPAGEORGIU (p. 773), by serological investigations comprising the complement-fixation tests, employing phenolized cultures as antigen, and by agglutination methods, comes to the conclusion that the various strains—human, canine, and slime fever strains—are antigenically related. Though some sera gave agglutination but not complement fixation, most yielded accordant results with both tests. *H. H. S.*

BESSEMANS (A.), WITTEBOLLE (P.) & DE BORCHGRAVE (O.). Leptospiroses canicole et ictérohémorragique en Belgique. [*Leptospira canicola* **and** *L. icterohaemorrhagiae* **in Belgium.**]—*C. R. Soc. Biol.* 1938. Vol. 129. No. 32. pp. 906–908. [22 refs.]

The authors examined the urine of 86 dogs from the neighbourhood of Ghent for the prevalence of leptospiral infection, with uniformly negative results. The serological examination of 68 also gave negative results, except in the case of one dog which was jaundiced, and whose serum produced lysis of *L. canicola* at first in dilutions of 1 : 500 and eight days later up to 1 : 5,000. Serological tests with *L. icterohaemorrhagiae* were negative.

In addition the authors examined various human sera including 3 suspected cases of jaundice, 5 from Wakken, and 358 Wassermann sera. Of these only 2 of the latter were positive, 1 lysing *L. canicola* up to 1 : 200 and the other *L. icterohaemorrhagiae* up to 1 : 500. It would seem, therefore, that leptospiral infections are rare in Belgium.

E. Hindle.

TARTAGLIA (Pierre). La spirochétose ictéro-hémorragique en Dalmatie. [**Spirochaetal Haemorrhagic Jaundice in Dalmatia.**]—*Bull. Office Internat. d'Hyg. Publique.* 1939. Mar. Vol. 31. No. 3. pp. 478–481.

A description of 11 cases of Weil's Disease in Dalmatia, all of which were diagnosed by serological tests.

Two of these cases occurred at Split and 9 in the neighbourhood of Metkovic; 9 of them had showed jaundice and 2 were without it. All the patients, with one exception, were agriculturists and 9 of them

engaged in eel-fishing in fresh water where they might be exposed to contamination. Wild rats were found to harbour the infection near Metkovic, the percentage of rats showing spirochaetes ranging from 11 to 20 per cent. The *p*H of the waters in that neighbourhood varied from 6·7 to 7·0, which would favour the survival of spirochaetes entering the water as a result of contamination with the urine of infected rats. *E. H.*

Montestruc (E.), de Palmas (M.), Pignol (A.) & Magallon-Graineau (E.). Premiers cas de leptospiroses diagnostiqués à la Martinique. [**The First Cases of Leptospirosis diagnosed in Martinique.**]—*Bull. Soc. Path. Exot.* 1938. Nov. 9. Vol. 31. No. 9. pp. 824–829.

The description of two cases in Martinique, one fatal, presenting symptoms suggestive of Weil's disease. Leptospira were found in the urine of the first case and in liver smears from the second (fatal) case. Attempts to isolate the organism by guineapig inoculation and by culture methods were unsuccessful, but the clinical symptoms were characteristic. About the same time as these two cases, there were numerous cases of a disease resembling dengue, and it is suggested [on very slight evidence] that these might have been mild cases of a leptospiral infection. *E. H.*

Mochtar (A.) & Esseveld (H.). Over de frequentie van leptospirosis in Ned.-Indië. [**The Frequency of Leptospirosis in the Netherlands Indies.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1939. Feb. 28. Vol. 79. No. 9. pp. 547–563. [60 refs.]

Sjöberg (Sven-Gösta). **Malignant Cases of Weil's Disease with Special Reference to Early Diagnosis.**—*Acta Med. Scandinavica.* 1939. Vol. 98. No. 6. pp. 536–541. [14 refs.]

A history of a fatal case of Weil's disease occurring in a clerk who lived near Stockholm and suddenly developed the disease without knowledge of any exposure to infection (rats, etc.), but since he lived by a lake known to contain leptospira pathogenic to dogs, this may have been the source of infection. The early symptoms suggested influenza, but jaundice developed on the 5th day, then collapse, hypotension, anuria, uremia and death on the 8th day. Hyperglycemia, a rare symptom, was also present.

Two similar fatal cases occurred in the same hospital (Seraphimer) in 1934 and 1935. The diagnosis was confirmed by blood cultures, which were positive on the 5th day of the disease, by the injection of guineapigs with urine, and the presence of spirochaetes in the liver.

The author is of the opinion that Weil's disease in Sweden is not very rare, and advocates the use of blood cultures to arrive at an early diagnosis in suspected cases, since serum therapy should commence as soon as possible. *E. H.*

Denéchau (D.) & Mandroux (J.). De la durée de l'incubation de la spirochétose (Leptospirose). A propos d'un cas à forme anictérique et méningée, à infestation d'origine murine nettement précisée. [**The Duration of the Incubation of Spirochaetosis (Leptospirosis). Concerning a Meningeal Case without Jaundice, with a Definite Origin from Rat Infestation.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1939. Feb. 20. 55th Year. 3rd Ser. No. 5. pp. 212–216. [10 refs.]

The description of a case of Weil's disease, without jaundice, in a butcher who became infected 17 days after skinning a guineapig that had been killed by rats, which is presumed to have been the source of the infection. The patient developed meningeal symptoms, but recovered after an attack lasting 13 days. *E. H.*

Murgatroyd (F.). **Further Note on a Case of Chronic Leptospiral Meningitis.** [Memoranda.]—*Brit. Med. Jl.* 1939. Mar. 4. pp. 445–446.

Further notes on a case of chronic meningitis in Weil's disease. [See this *Bulletin*, 1937, Vol. 34, p. 358.]

In view of the recovery of leptospira from the patient's cerebro-spinal fluid 6 and 8 months respectively after the onset of the disease, it had been suggested that the guineapigs used for the diagnostic inoculations might have suffered from extraneous infections.

This patient's serum, more than two years after his attack, has recently been examined by Major H. C. Brown, and found to agglutinate leptospira to a titre of almost 1 in 1,000. These results confirm the original diagnosis and show that this patient had acquired a leptospiral infection which remained active for more than eight months. *E. H.*

Eschbach (H.). Spirochétose avec plaie cutanée, adénite et méningite. [**Spirochaetosis with Cutaneous Sores, Adenitis and Meningitis.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1939. Mar. 6. 55th Year. 3rd Ser. No. 7. pp. 290–291.

The record of a case of Weil's disease in a 12-year-old child who showed reactions of the lymphatic glands accompanying a cutaneous eruption, and meningo-encephalitis. *E. H.*

Carlinfanti (E.). Studien ueber die antigenen Eigenschaften der *Spirochaeta icterohaemorrhagiae.* [**Studies on the Antigenic Properties of** *Spirochaeta icterohaemorrhagiae.*]—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1938. Dec. 12. Vol. 94. No. 5/6. pp. 426–436.

The author tested the properties of alcoholic extracts of various strains of Leptospira, including two Weil strains, " Chinese," and rat 104, one dog strain " 803/04," and a strain " Moscow " of *S. grippotyphosa.*

The extracts were prepared by growing each strain in 5 litres of 10 per cent. rabbit serum with 90 per cent. tap water, and after passing through filter paper centrifuging the well grown cultures for an hour.

Ten volumes of 96 per cent. alcohol were then added to the sediment and the mixture left in the incubator, shaken from time to time and finally filtered. The filtrate containing the extract was diluted with 10 to 15 volumes of normal saline before being used.

Rabbits inoculated with strains of living or dead leptospira developed immune sera which gave specific complement fixation with these alcoholic extracts and also positive flocculation tests. These reactions occurred not only between extracts of any particular strain and its homologous antiserum, but also between extracts of heterologous strains and various leptospiral antisera. However, leptospiral antisera gave completely negative reactions with Wassermann antigens. It would seem that the antisera react only with leptospiral lipoids and not against a ubiquitous lipoid, as in the case of *S. pallida*.

The serum of patients with Weil's disease and of dogs infected with Stuttgart disease was found to react with leptospiral extracts, but not infrequently positive results were also obtained with alcoholic organ extracts. The serum of mice infected with relapsing fever, and of rabbits immunized against various bacteria, gave no reaction with leptospiral extracts. Positive Wassermann sera of syphilitic patients gave negative reactions when the leptospiral extracts were used as antigen, but gave positive flocculation tests.

It seems not unlikely that this reaction between syphilitic sera and leptospiral lipoids depends on the presence in both the leptospira and Wassermann antigen of a common alcohol-soluble partial antigen.

These results are of especial interest as they show the application to other infections of Hirschfeld and Klinger's flocculation test for the serum diagnosis of syphilis. *E. H.*

Morrow (Grant), Syverton (Jerome T.), Stiles (William W.) & Berry (George Packer). **The Growth of *Leptospira icterohemorrhagiae* on the Chorio-Allantoic Membrane of the Chick Embryo.**—*Science.* 1938. Oct. 21. Vol. 88. No. 2286. pp. 384–385.

The authors have succeeded in growing a human strain of *Leptospira icterohaemorrhagiae* on the chorio-allantoic membrane of the fowl embryo.

Eggs that had been incubated for ten days were each inoculated on the chorio-allantoic membrane with 0·1 cc. of a positive culture. Transfers were made every four or five days by grinding up two or three membranes in Locke's medium to make a 10 per cent. suspension and inoculating 0·1 cc. The spirochaetes were carried through twenty successive passages in developing eggs and every five passages guineapigs injected with the "transfer inoculum." In every case these animals became infected and died in six to eight days with typical symptoms of Weil's disease.

The organisms were found to invade the tissues of the developing embryo and produced death within six to seven days. Grossly the membranes showed grayish opaque, pin-point nodules, the result mainly of localized proliferation of the ectoderm cells, and of oedema, proliferation of the fibro-blasts and infiltration of a few inflammatory cells in the mesoderm. Sections stained by Levaditi's silver method showed the presence of spirochaetes both in the membranes and embryos. *E. H.*

PAPAGEORGIU (S.). Ueber die Komplementbindungsreaktion bei Leptospirosen. [**The Complement Fixation Test for Leptospira.**]—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1938. Dec. 12. Vol. 94. No. 5/6. pp. 489–504. [37 refs.]

The author has made a comparative study of the complement fixation test and agglutination reactions of 31 sera from various cases of typical Weil's disease, also of dog and slime-fever strains, and in addition of monovalent immune sera against ten various leptospiral strains.

As antigen for the complement fixation tests, well-grown cultures were killed by the addition of 0·3 per cent. phenol and after passing through filter paper, centrifuged for at least four hours at 3,000–3,500 revolutions.

The results of the tests show that in a large number of sera similar results are obtained with both the complement fixation test and agglutination. In some cases, however, a serum would give a positive agglutination reaction, whilst the complement fixation test was negative. Whilst the agglutination showed a constant strain, or group specificity, the complement fixation test seemed to have a greater range in its reaction.

The results confirm the generally accepted view that antigenically the different strains of leptospira are all more or less related.

E. H.

RAT-BITE FEVER.

Précis of Abstracts in this Section.

COLARUSSO (p. 773) records two cases, both diagnosed on the grounds of history and symptoms, for the spirillum was not seen in the blood of either patient. One was a boy of 14, the other a man of 52 years; both were bitten on the finger and in both cases symptoms set in after the wound had apparently healed completely. In YAMAMOTO's contribution (p. 774) and in the succeeding article are recorded cases of sodoku following bites by cats. Two of the three were typical in course, the third developed a complicating periorchitis and epididymitis. MOLLARET and BONNEFOI (p. 774) discuss the rôle of the cat in transmission of sodoku and point out that further investigation is needed to decide whether the cat is a true reservoir of the spirillum or whether it acts as an incidental transmitter from an infected rat which it has killed or eaten.

H. H. S.

COLARUSSO (Andrea). Su due casi di sodoku. [**Two Cases of Rat-Bite Fever.**]—*Riforma Med.* 1938. Dec. 3. Vol. 54. No. 48. pp. 1839–40, 1843–4, 1845–6. [26 refs.]

The first patient was a lad of 14 years bitten on the finger by a field-rat which he was trying to capture. The wound healed without treatment. Four weeks later he felt local pain and had a rigor with typical fever course and enlargement of regional glands. The second was a man of 52 years also bitten on the finger, and in his case too the

wound healed untreated, but the finger swelled and became painful and inflamed and was incised, pus being expected, but only blood appeared. Both patients exhibited the usual symptoms and the disease ran a typical course. The diagnosis was made on the history and symptoms for in neither was the spirillum found on blood examination. *H. H. S.*

YAMAMOTO (Seinosuke). Rattenbisskrankheit durch Katzen-Biss (od.-Kratz). [**Sodoku caused by the Bite of a Cat.**]—*Japanese Jl. Dermat. & Urol.* 1938. Oct. 20. Vol. 44. No. 4. pp. 118–119. [Summary appears also in *Bulletin of Hygiene.*]

The author records two cases, one a man of 35, the other a boy of 11 years, each bitten on a finger by a kitten. One week and two weeks later respectively the patients suffered with fever, adenitis and an erythematous rash. Inoculation of the blood into mice led to the discovery of *Sp. minus* in each case. *H. H. S.*

MOLLARET (P.) & BONNEFOI (A.). Un cas de *Biokoshio* (*Sodoku* après griffade et morsure de chat), avec périorchite résolutive. Considérations sur le rôle du chat dans la transmission de *Spirillum morsus muris.* [**A Case of Biokoshio (Sodoku from the Scratch and Bite of a Cat) with Resolutive Periorchitis. Considerations on the Rôle of the Cat in the Transmission of** *Spirillum minus.*]—*Bull. Soc. Path. Exot.* 1938. Nov. 9. Vol. 31. No. 9. pp. 855–866. With 1 chart. [14 refs.]

The description of a case of Sokodu in a 12 year old child from Soissons, who was scratched and bitten by a cat, and two weeks later came to the Institut Pasteur in Paris for anti-rabic treatment. Subsequently the child developed typical symptoms of Sodoku which responded to treatment with arsenicals. Of special interest was the development of a periorchitis of the testicular envelopes, and the epididymis, but not involving the glands. Attempts to infect both mice and guineapigs were negative, but the serum of the patient was found to produce complete lysis of a culture of *S. minus* within 11 minutes.

The second part of the article comprises a useful discussion of the part played by the cat in the transmission of this disease. Whilst certain authors consider that the cat is a true reservoir of the virus, it is possible that the many undoubted cases of infection produced by the scratch or bite of these animals may be merely the result of the cat being contaminated by having recently killed, or fed upon, an infected rodent. The authors consider that the problem requires re-investigation. *E. Hindle.*

MALARIA.

PRÉCIS OF ABSTRACTS IN THIS SECTION.

WATSON (p. 777) sums up the progress of malaria work since the time of Ross.

Malaria is only feebly endemic in Coquilhatville in the Congo. SCHWETZ and BAUMANN (p. 777) found low infection rates at all ages, but higher in adults than children. *A. marshalli* var. *moucheti*, a potential vector, is common, but *A. gambiae* was not seen. *P. vivax* was not found. The films were taken at the most unhealthy time of the year. In a further investigation in the lower reaches of the Congo River basin, however, SCHWETZ and GERONNEZ (p. 777) found low rates in Thysville, 800 metres above sea level and well away from the river, very high rates at Luozi on the river bank and moderate rates at Timanzi, 750 metres above sea level and away from the river. *P. vivax* was common at Luozi but rare in the other two places. The examinations were made at the end of the dry season. In the Kwango River area the same authors (p. 778) found high parasite rates in children, with many gametocytes, though parasites were not numerous. In the river-side places *A. gambiae* was very prevalent. *P. vivax* was rare and *P. falciparum* and *P. malariae* were about equally prevalent. These examinations were made in the dry season.

In Holland, according to VAN THIEL and BEVERE (p. 778), *A. maculipennis atroparvus* prefers pig to man in the proportion of 12 to 1, and in Italy *labranchiae* and *elutus* appear to prefer man, though the results were not so marked. In Hanoi, CHEDECAL (p. 779) observed that horses proved attractive to *A. vagus* and *A. hyrcanus* var. *sinensis* which though common in stables were rarely found in adjacent houses. This fact is of value in prophylaxis. VARGAS (p. 779) in Timixco found that 33 per cent. of 420 *A. pseudopunctipennis* preferred to feed on man when given an equal opportunity of feeding on animals.

In the *Bulletin de l'Office Internationale d'Hygiène Publique* it is shown that in Egypt *A. pharoensis* is a common vector and *A. sergenti* a probable vector. In the Congo, DUREN (p. 780) found that the species carrying malaria are *A. gambiae, A. funestus, A. moucheti, A. nili, A. pharoensis* and *A. rufipes*, but the last two are so rare that their rôle in this respect is negligible.

BOYD and MATTHEWS (p. 780) investigated two patients 7 years after infection with the McCoy strain of *P. vivax*. Immunity was clearly present although no parasites were found in their blood when tested by injection into other patients. Reinfection with heavy doses of the same strain produced only slight parasitological responses and a slight clinical attack in one patient only. The antigenic identity of the parasite has therefore been maintained through 40 passages in man and anophelines.

In endemic areas SICAULT and MESSERLIN (p. 781) observed that although spleen and parasite rates decreased with age, the serological index increased. Of the inhabitants 44 per cent. showed neither parasites, enlarged spleen nor positive melanoflocculation, and were no more prone to febrile attacks than those showing evidence of infection. The authors therefore consider that a true immunity not depending upon the existence of parasites in the body may develop side by side with premunition. DECOURT (p. 782) states his experience that the value of Henry's reaction has been established, but that a positive result does not always indicate parasites in the blood. The intensity of the reaction in naturally acquired malaria varies directly with the number of attacks. He postulates a non-specific as well as a specific immunity, but Henry's reaction cannot distinguish between them.

JOLLY and DANGLEMONT (p. 782) from a study of two cases of pernicious *P. falciparum* malaria note an early marked increase of

the blood urea. Heavy infections with all stages of schizogonic forms were present and owing to the rapid destruction of parasites and red cells the phagocytes were unable to deal with the débris. Mobilization of phagocytes may contribute to capillary embolism and blocking of the kidneys and the resulting coma is both parasitic and toxic. Prognosis depends on attempts to restore renal function.

SCHWETZ (p. 783) discusses congenital malaria, considering it to be an incident in acute malaria of the mother. In populations suffering from endemic afebrile malaria the results of investigations of congenital malaria are consistently negative.

GARDNER and DEXTER (p. 783) report a patient infected by *P. malariae* after a blood transfusion from a donor who had not had an attack of malaria for 17 years, during which time he had lived in northern U.S.A. No parasites could be found in the blood of this donor. Successful treatment with sulphanilamide is recorded.

TSCHILOW (p. 784) reports a case of what he regards as paramalarial hepato-splenomegaly with infantilism. ROGER and BOUDOURESQUES (p. 784) have seen only one case, in 15 years, in which they were satisfied that polyneuritis was caused by malaria. Many malarial patients attend their clinic.

PRUDHOMME (p. 784) gives a method for the detection and estimation of quinine in urine, blood or viscera. For details the original abstract should be consulted.

In treatment, MALYCHEVA (p. 785) obtained rather better ultimate results by spreading the administration of acriquine (atebrin) over 11 days in a period of one month than as a 7 consecutive days' course. TEICHLER (p. 785) considers that short courses of atebrin, 0·1 gm. thrice daily for 3 days, can maintain the health of a native labour force in highly malarial districts of Tanganyika Territory. CHOPRA and BASU (p. 786) report that treatment of 3 gametocyte carriers of *P. falciparum* with cilional and atebrin for 5 days did not prevent infection of *A. stephensi* from them.

The results of the treatment of benign and malignant tertian malaria with prontosil rubrum and prontosil soluble obtained by MENK and MOHR (p. 786) were unsatisfactory. The state of immunity is probably a factor in this treatment. But FARINAUD and RAGIOT (p. 786) report that the schizonticidal action of soluseptasine justifies its use.

VAN RIEL (p. 787) found that cuprochin was ineffective in *P. falciparum* malaria.

Ascoli's treatment was successful in the hands of SERRA (p. 787).

In discussing the relationship between irrigation and malaria in India RUSSELL (p. 787) points out that it is defective irrigation which is responsible. Many items are detailed but perhaps the most important are the absence of drainage canals and general untidiness through neglect of proper maintenance and planning of the canals and channels. Subsoil water has in places risen greatly through the effects of barrage construction. He urges organization and co-operation between all agencies concerned, but his detailed recommendations are to be published later.

AFANASSIEV (p. 788) has tested and recommends the distillate of coke filters obtained in the final stages of fractional distillation of Russian petroleum for the destruction of anopheline larvae in nature, using doses generally employed with petroleum.

Roy (p. 789) does not consider that the small fish *Panchax panchax*, common in Bengal, is of much value in anti-larval work. *C. W.*

Watson (Malcolm). **Malaria and Mosquitoes : Forty Years On.**—Paper read before the Dominions and Colonies Section of the Royal Society of Arts on Feb. 7, 1939. [Uncorrected proof.]

This is an interesting narrative of the progress in the prevention of malaria since Ross made his discovery in 1898. Ross's hopes and disappointments ; early failures in attempts at anopheline control and their effect in retarding malaria prevention ; successes in Panama and Malaya ; species sanitation ; recent progress in many parts of the world, and the contribution to malaria control made by the Ross Institute are graphically described. *Norman White.*

Schwetz (J.) & Baumann (H.). Recherches sur le paludisme endémique chez les noirs de l'agglomération de Coquilhatville. [**Endemic Malaria among Native Inhabitants of Coquilhatville.**]—*Ann. Soc. Belge de Méd. Trop.* 1938. June 30. Vol. 18. No. 2. pp. 259–276.

A very careful parasite survey revealed the surprising fact that malaria in Coquilhatville is very feebly endemic. Coquilhatville is situated on the Equator at the junction of Ruki River with the Congo. The climate is therefore hot and moist and the seasons are little marked. The blood films were taken at the most unhealthy time of the year. An insignificant number of infants below the age of two years was found infected ; the proportion of infected among children from 3 to 5 was slightly higher, but here again the number of parasites harboured by the infected was very small. Between ages 5 to 10 the proportion infected was about the same as for the 3–5 age group but the parasites were somewhat less numerous. Thereafter there was a progressive diminution of the numbers infected and the parasites harboured till adult age. Low as was the degree of infection of adults it was higher than that of infants, a very exceptional finding in the Congo. Gametocyte carriers were very rare. *P. vivax* was not found at all and *P. malariae* was extremely rare. Mosquitoes are very numerous. The most common anopheline in Coquilhatville was *A. marshalli* var. *moucheti*, a potential vector. *A. gambiae*, almost ubiquitous in the Congo, was not noted. Further observations will be awaited with interest.

N. W.

Schwetz (J.) & Geronnez (E.). Sur le paludisme endémique du Bas-Congo. IV.—Le paludisme chez les noirs de la région des Cataractes. [**Endemic Malaria among Inhabitants of the Cataract Region of the Lower Congo.**]—*Ann. Soc. Belge de Méd. Trop.* 1938. June 30. Vol. 18. No. 2. pp. 277–282.

This note records the results of the examination of 275 natives, mostly children, in September–October, the end of the dry season, in three places in the Cataract Region between Leopoldville and Matadi. Thysville, about 800 metres high, is on the Leopoldville-Matadi railway line. Luozi is on the bank of the river. Timanzi between the river and the railway is about 750 metres high on a plateau. In Thysville the proportion of infected was low and in them parasites were few ; *P. vivax* was very rare. In Luozi the infection rate was very

high, parasites were very numerous and double or triple infections were common, as were gametocyte carriers. *P. vivax* was much in evidence. The spleen rate of the 71 children examined was 78·9 per cent. and the parasite rate 95·8 per cent. In Timanzi there was a spleen rate of 40 per cent. and a parasite rate of 82 per cent. (73 children examined). Parasites were relatively few in numbers, mostly discoverable only in thick drops. Very few cases of *P. vivax* infection were noted. The different degrees of endemicity in three adjacent places is noteworthy. *N. W.*

Schwetz (J.) & Geronnez (E.). Sur le paludisme endémique du Bas-Congo. V.—Le paludisme chez les noirs de quelques agglomérations riveraines du Kwango. [**Endemic Malaria among Natives in Certain Villages on the River Kwango, Lower Congo.**]—*Ann. Soc. Belge de Méd. Trop.* 1938. June 30. Vol. 18. No. 2. pp. 283–289.

A note on the findings in blood films of 296 natives living between Popokabaka and the William Falls gives an indication of the degree of endemicity of malaria in the Kwango region. The films were taken in the dry season. Everywhere *A. gambiae* was the prominent vector. In Popokabaka 23 out of 24 infants between 9 months and 2 years harboured parasites ; 23 out of 25 children from 2 to 5 years ; 16 out of 23 children from 6 to 14, and 6 out of 19 adult women. Parasites were relatively few in number. *P. malariae* was very frequently found ; *P. vivax* was seen in only 3 cases. A large proportion of infants below 5 years harboured gametocytes. In Kasongo Lunda 23 infants up to 5 years of age were all infected as were 28 out of 30 children from 6 to 14 years. Twenty out of 42 adult women harboured parasites. Here again parasites were few in number. In children from 2½ to 5 years more than half the parasites were *P. malariae* ; *P. vivax* was seen only once. In Mahonga on the Kasanga plateau, where no anophelines were found, only 1 of 9 infants below 2 years was infected ; 10 of 12 children from 3 to 5 ; 7 of 22 from 5 to 14, and 10 of 36 adults. Parasites were few in number. In Kolomoni near the Francis Joseph Falls 6 of 7 children below 4 years were infected ; above that age only 1 of 16 examined harboured parasites. All the places mentioned except Mahonga are situated on the Kwango River. In these river-side places *A. gambiae* is very prevalent. Though the percentage infected was high parasites were few. *P. falciparum* and *P. malariae* were almost equally prevalent, *P. vivax* very rare. The proportion of *P. malariae* infections on the Kwango River is unusually high.

N. W.

van Thiel (P.) & Bevere (L.). Preuve expérimentale de l'anthrophilie d'*Anopheles maculipennis labranchiae* et *elutus*. [**Experimental Proof that** *Anopheles maculipennis labranchiae* **and** *elutus* **prefer Human Blood.**]—*Bull. Soc. Path. Exot.* 1939. Jan. 11. Vol. 32. No. 1. pp. 103–109.

The authors have offered man and pig to *Anopheles* which were confined in a very large cage under conditions which approached the natural.

The experiments were carried out in a large cage of mosquito netting, measuring about 16×23 ft.×7 ft. high. In this a man and a pig spent

the night in small chambers : mosquitoes liberated in the main cage, could enter either small chamber, but could not escape from it. The apparatus appears to be simpler, and therefore better than that previously described by REUTER [see this *Bulletin*, 1937, Vol. 34, p. 630]. Working in Holland, the authors found that the local *atroparvus* prefer pig to man, the numbers attacking the two hosts differing on the average of 12 to 1. The apparatus was then moved to the province of Foggia, Italy, and tested with *labranchiae* and *elutus*, which were caught in stables, kept for one to three days and then liberated in the large cage. A number of difficulties were encountered, and the figures which are given at length are not perhaps quite conclusive though perhaps statistical tests appropriate to small numbers would be helpful. Generally speaking, it seems that man was bitten by about twice as many of these mosquitoes as pig. *P. A. Buxton.*

CHEDECAL. Contribution à l'étude du comportement trophique des anophélines à Hanoi. (Enclos du 9e R.I.C.). [**Feeding Characteristics of Anophelines in Hanoi.**]—*Rev. Méd. Française d'Extrême-Orient.* 1938. Oct. Vol. 21. No. 8. pp. 1007–1011.

Urbanization has much diminished the prevalence of anophelines in Hanoi but there are areas where they are still to be found. Among these is the citadel in which the 9th R.I.C. are stationed. The lines contain stables which accommodate 160 horses. Anopheles found were *vagus*, *hyrcanus* var. *sinensis*, *tesselatus* and *aconitus*. *A. vagus* and *A. sinensis* were much the most prevalent. There was no locally contracted malaria during the seventeen months of the observations ; the 64 cases that did occur among the garrison of 900 were all old infections. No case of malaria occurred among the officers' children housed nearby. Anophelines were very rarely found in human habitations but they were always present in large numbers in the stables. Of engorged anophelines only 0·9 per cent. of *sinensis* contained human blood, and only 2·7 per cent. of *vagus*. Nearly all the others contained horse blood. The attraction of horses for anophelines is thus marked and is of value in prophylaxis. *N. W.*

VARGAS (Luis). Observaciones sobre la preferencia alimenticia sanguinea de la Pseudopunctipennis en Temixco, Morelos. [**Blood Preferences of** *A. pseudopunctipennis* **in Temixco.**]—*An. Inst. Biol.* Mexico. 1938. Mar. & June. Vol. 9. Nos. 1 & 2. pp. 201–208.

In Temixco, which is highly malarious, *A. pseudopunctipennis* is the sole vector. Of 245 engorged females of this species captured in houses 67·6 per cent. contained human blood. By the use of mosquito traps such as those described by EARLE & HOWARD as used in Porto Rico [this *Bulletin*, 1937, Vol. 34, p. 636], *A. pseudopunctipennis* was given equal opportunities of feeding on man or one or other of several of the lower animals. Of 420 mosquitoes with equal facilities of feeding on man or cow, 33 per cent. fed on man. Of 677 mosquitoes with a horse as an alternative food supply to man, 27 per cent. selected man.

N. W.

Bulletin de l'Office International d'Hygiène Publique. 1938. Dec. Vol. 30. No. 12. pp. 2789–2792.—La transmission du paludisme par les diverses espèces d'anophèles égyptiens. [**Transmission of Malaria by Egyptian Species of Anopheles.**]

The most prevalent species of *Anopheles* in Egypt are *pharoensis, multicolor, mauritianus* and *sergenti*. Other species found with a local distribution, and playing no part in the spread of malaria in the Nile valley, are *rhodesiensis* (*dthali*), *superpictus, aegypti* and *turkhudi*. *A. pharoensis* is readily infected in the laboratory and has been found infected in nature. It is commonly found in human habitations. It explains the relation between rice cultivation and malaria prevalence; rice fields are favoured breeding places. It is the most prevalent anopheline in Egypt. *A. multicolor* has never been found infected and it is very rarely found in human habitations though these be close to breeding places of this species. *A. sergenti* has been found harbouring oöcysts but not sporozoites; it is easily infected experimentally. It is very probably a vector. *A. mauritianus* enters habitations and bites man but it has not been found naturally infected; an attempt to infect it experimentally failed. *N. W.*

Duren (A.). Etat actuel de nos connaissances sur les anophèles du Congo belge. [**Present Knowledge of Anopheles of Belgian Congo.**] —*Ann. Soc. Belge de Méd. Trop.* 1938. Dec. 31. Vol. 18. No. 4. pp. 557–580. With 5 maps. [13 refs.]

The author has gathered together all available information concerning the species of Anopheles that have been found hitherto in the Belgian Congo. Maps illustrate the distribution of the most prevalent species. Following the recent classification of Edwards and Evans the list of Anopheles contains 32 species and 6 varieties. The only species that have been incriminated as vectors of malaria are *gambiae, funestus, moucheti, nili, pharoensis* and *rufipes*. The two last named are so rare that their importance as transmitters is negligible. It is not possible to summarize in small space the large amount of information that this paper contains. *N. W.*

Bates (Marston). **Hybridization Experiments with** *Anopheles maculipennis.*—*Amer. Jl. Hyg.* 1939. Jan. Vol. 29. No. 1. Sect. C. pp. 1–6. [12 refs.]

Cova-Garcia (Pablo). Notas sobre los anofelinos de Venezuela y su identificación. [**Anophelines of Venezuela.**]—*Bol. Ministerio de Sanidad y Asistencia Social.* Caracas. 1939. Jan. Vol. 4. No. 1. pp. 7–59. With 10 plates. [37 refs.]

Senevet (G.) & Abonnenc (E.). Quelques anophélinés de la Guyane française. [**Anophelines of French Guiana.**]—*Arch. Inst. Pasteur d'Algérie.* 1938. Dec. Vol. 16. No. 4. pp. 486–512. With 10 figs. & 1 plate. [10 refs.]

Boyd (Mark F.) & Matthews (Choice B.). **Further Observations on the Duration of Immunity to the Homologous Strain of** *Plasmodium vivax.*—*Amer. Jl. Trop. Med.* 1939. Jan. Vol. 19. No. 1. pp. 63–67.

The first-named author reported in 1936 that an effective homologous immunity to the McCoy strain of *Plasmodium vivax* may endure for

more than three years. The conclusion was based on observations made on a patient who was re-examined from the same point of view in 1938, nearly seven years after the primary attack. Observations are also reported on another patient whose primary attack was almost contemporaneous with that of the first.

The first patient was first inoculated with the McCoy strain in December 1931 ; a primary attack lasting 22 days was followed by two relapses. Three and a half years later he was inoculated intravenously with 18 cc. of blood containing 180 million trophozoites of the same strain. There was no clinical reaction. In July 1938 he harboured no detectable parasites and inoculation of 10 cc. of his blood into a susceptible patient showed that he had no submicroscopic latent infection. He was then bitten by 10 infected mosquitoes ; nine days later parasites were detected and remained intermittently detectable for 15 days, though never more than 15 per cmm. There was no clinical reaction. The following month he was given an intravenous injection of 10 cc. of infected blood, containing 159 million trophozoites. There was no clinical or parasitological response whatsoever.

The second patient whose primary attack was in August 1931, was also shown to have no latent malaria infection in July 1938. He was bitten by 8 demonstrably infected mosquitoes ; nine days later parasites were detected and he experienced a clinical attack consisting of but one paroxysm. Parasites were detectable for 10 days the maximum density being 1,100 per cmm. After the disappearance of the parasites he too received an intravenous injection of the same amount of infected blood and from the same source as the first patient received. Eight days later parasites were detected for three days, but never exceeding 20 per cmm. There was no clinical reaction.

The observations show that during the period of more than six years the McCoy strain of *P. vivax* has maintained its original antigenic identity through 40 human-anopheline passages. *N. W.*

Sicault (G.) & Messerlin (A.). Index sérologique et prémunition dans le paludisme endémique. [**Serological Index and Premunition in Endemic Malaria.**]—*Bull. Soc. Path. Exot.* 1938. Dec. 14. Vol. 31. No. 10. pp. 911–915.

The serological technique used in this inquiry was the authors' micro-reaction [see this *Bulletin*, 1939, Vol. 36, p. 395]. In endemic areas the spleen, parasite and serological indexes were determined for persons in age groups as follows :—0–5 years, 127 ; 6–10 years, 105 ; 11–16 years, 69 ; adults, 498. The spleen index (44·9, 45·7, 52·1 and 25·8) and the parasite index (44·3, 31·4, 30·4 and 19·6) decrease as age advances ; the serological index increases (25·9, 33·3, 39·1 and 52·4). During attacks of fever melano-flocculation is often negative. Nearly all patients with very large spleens, in the absence of fever, gave positive melano-flocculations. Among the inhabitants of an endemic area, in relatively good health, 44 per cent. showed neither parasites nor enlarged spleen nor a positive serological reaction. Six months' observation showed that this portion of the population was not more prone to febrile attacks than those with some positive sign of malaria infection. The authors conclude that in endemic malaria, side by side with premunition which is dependant upon the existence of parasites in the body, a true immunity, not dependant upon the existence of parasites, may be developed. *N. W.*

DECOURT (Ph.). Sérologie et immunité au cours du paludisme. A propos de la communication de G. Sicault et A. Messerlin. [**Serology and Immunity in Malaria, with reference to the Work of Sicault and Messerlin.**]—*Bull. Soc. Path. Exot.* 1939. Jan. 11. Vol. 32. No. 1. pp. 7–11.

The author refers to a report by SICAULT and MESSERLIN on the determination of a serological index in a region of high malaria endemicity and to their discussion of malaria immunity [see above]. He contrasts their contentions with his own findings. Ten years observations of Henry's reaction in patients undergoing malaria therapy in Paris have confirmed the value of the reaction but a positive reaction does not always indicate the presence of parasites in the blood. In patients inoculated by injection of infected blood the reaction becomes positive after a certain number of febrile attacks ; a positive reaction may persist after the cure of the patient, involving the eradication of the parasite, for a period longer than the duration of the malaria infection. Patients infected by injection of infected blood in non-malarial regions never relapse. In naturally acquired malaria the intensity of the reaction varies directly with the number of attacks of malaria from which the patient has suffered. In addition to a specific immunity the author postulates a non-specific immunity connected with endothelial irritation by destruction products of parasites and red-cells, especially melanin, and not dependant upon the presence of the parasite. To distinguish malaria immunity from the conception of premunition, which is considered too narrow, the term immunition is used, a term which NICOLLE employed to describe "immunity following a natural infection." Serological reactions afford evidence of immunition and may measure it, to a certain degree. The author is unable to agree, however, that serological reactions are either strictly specific or capable of the aetiological separation of immunological phenomena which are probably multiple and certainly very complex. *N. W.*

JOLLY (A.) & DANGLEMONT (F.). Accès pernicieux palustres à *Plasmodium falciparum* avec évolution schizogonique complète du parasite dans le sang périphérique et hyperazotémie considérable transitoire. [**Pernicious Attacks of *falciparum* Malaria with Complete Schizogony Cycle of Development of Parasite in Peripheral Blood and Considerable Transitory Increase of Nitrogen Content of Blood.**]—*Bull. Soc. Path. Exot.* 1939. Jan. 11. Vol. 32. No. 1. pp. 50–58. With 3 figs.

This is an interesting report of two cases of pernicious *falciparum* malaria in Guadeloupe, one of which was fatal. Both were extremely heavy infections ; in both all stages of the schizogony cycle of development were found in the peripheral blood ; rosettes were numerous. The urea content of the blood was very markedly increased quite early in the attack. When the lack of organic resistance allows this development of schizogonic forms and extremely rapid multiplication of parasites the pernicious syndrome commonly results. The schizogonic forms of *P. falciparum* are extremely fragile ; there is an important destruction of parasites and red cells ; numerous rosette forms are seen free from their red cells, or phagocytosed by macrophages ; blood cell and parasite débris is present in such abundance that the phagocytes though increased in number are unable to cope with it.

This abundance of débris is believed by the authors to play an important part in determining pernicious attacks by mobilizing macrophages, which contribute to capillary embolism, and by blocking the kidneys. This blocking of the kidneys results in anuria and uraemic symptoms. The resulting coma is both parasitic and toxic. The prognosis is dependant on the result of attempts to restore renal function.

N. W.

Schwetz (J.). Considérations sur le paludisme congénital. [**Congenital Malaria.**]—*Bull. Soc. Path. Exot.* 1939. Jan. 11. Vol. 32. No. 1. pp. 44–50.

The author contributes no fresh observations on congenital malaria ; he refers to his own published findings and to numerous other reports that have appeared in malaria literature. He concludes that the numerous undoubted cases of congenital malaria reported were incidents in acute malaria, that is to say that the mother had suffered from febrile attacks during pregnancy or actually during, or little before, confinement ; in nearly all these cases *P. vivax* was responsible for the infection. On the other hand the investigation of congenital malaria among populations suffering from endemic, afebrile malaria, has consistently given negative results, and this in spite of the fact that numerous *P. falciparum* parasites were sometimes found in the maternal blood and also in the placenta. The explanation of this difference is unknown ; perhaps it is due to the greater friability and permeability of the placenta caused by febrile malaria. The harmful effect on the infant of malaria parasites in the placenta, reported by Blacklock and Gordon, 1925, has not been noted by other authors [see this *Bulletin*, 1926, Vol. 23, p. 130].

N. W.

Gardner (William A.) & Dexter (Lewis). **A Case of Quartan Malaria following Transfusion and treated with Sulfanilamide.**—*Jl. Amer. Med. Assoc.* 1938. Dec. 31. Vol. 111. No. 27. pp. 2473–2475. [13 refs.]

A woman aged 30 who had never had malaria nor lived in a malarious locality was operated on ; a cold abscess was excised. To combat post-operative weakness she was given two transfusions of 600 cc. of whole blood. A month after the first transfusion she had the first of a series of severe rigors, the temperature rising to 103° to 105°F. The chills occurred at regular intervals of three days. She was re-admitted to hospital ; ring forms and gametocytes of *P. malariae* were found in the blood. The donor of the first transfusion had had quartan malaria seventeen years previously while serving with the Italian Army in Albania. He then returned to the U.S.A., since when he has made trips to Washington and Baltimore but never farther south. He has had no attacks of fever during these seventeen years ; no parasites were found in his blood. In spite of this the authors believe that the transfusion was responsible for the malaria infection. There was no other possible ascertainable source of infection.

The patient was treated with sulphanilamide, 3·6 gm. a day for 17 days. No toxic symptoms were observed. Chills ceased, parasites disappeared and the spleen decreased in size. The authors consider that the drug should be further tried in a large series of cases of malaria.

N. W.

Tschilow (Konstantin). Malarischer Infantilismus. [**Malarial Infantilism.**]—*Wien. Klin. Woch.* 1939. Feb. 24. Vol. 52. No. 8. pp. 183–185.

A case of a 20 year old girl with a small thyroid, appearances of myxoedema, defective mentality, undeveloped genitals, complete absence of secondary sexual characters, considerable enlargement of liver and spleen with intermittent haemolytic crises. After 8 months of observation and treatment with quinine and hormones menstruation developed for the first time, as well as secondary sexual characters, there was also a considerable increase in weight and height. The author considers that it can be confidently asserted that this case was one of paramalarial hepato-splenomegaly; although he found no malarial parasites in the blood yet the fact that the patient came from a well known malarial district and gave a history of a past malarial infection, as well as the blood picture, supported the diagnosis of malaria. Further under quinine treatment the size of the liver and spleen diminished. *E. D. W. Greig.*

Roger (Henri) & Boudouresques (Jacques). La polynévrite paludéenne. [**Malarial Polyneuritis.**]—*Marseille-Méd.* 1938. Nov. 5–15. Vol. 75. No. 31–32. pp. 493–522. [54 refs.]

A lengthy and very complete dissertation on the association of malaria with polyneuritis and a critical discussion of very numerous cases reported in the literature of the subject. That genuine malarial polyneuritis is a rare condition is shown by the fact that among the very numerous patients from malarial countries that have been seen in the Neurological Clinic of Marseilles during 15 years only one case of polyneuritis was observed in which the authors were satisfied as to the aetiological rôle of malaria. This case is described at length.

N. W.

Prudhomme (R. O.). Nouvelle méthode de dosage de la quinine. [**New Method for the Detection and Estimation of Quinine.**]—*Bull. Soc. Path. Exot.* 1938. Dec. 14. Vol. 31. No. 10. pp. 929–932.

The test is based on the property possessed by quinine and several other alkaloids of forming with certain acid dyes, such as eosin, coloured combinations insoluble in water but soluble in chloroform. The *p*H of the medium in which the reaction is determined is of great importance. The colouration of the chloroform is at its maximum between *p*H 6·5 and 7·6. At a given *p*H the tint of the chloroform is proportional to the amount of quinine present. Standard colorimetric preparations are made with varying quantities of quinine sulphate, quantities which would vary according as to whether urine, blood or organs were to be examined. The author describes the technique for the examination of the urine. It is necessary to clarify the urine for which purpose a reagent must be used that does not precipitate the quinine. The author uses a 10 per cent. solution of neutral acetate of lead. The excess of lead is eliminated by the addition of sulphuric acid.

In a test tube place 10 cc. of the urine ; add 5 cc. of the acetate of lead solution ; filter ; to 12 cc. of the filtrate add 5 drops of sulphuric acid in a concentration of 65°B.* ; shake and filter several times through the same paper until a perfectly clear liquid is obtained ; to 9 cc. of the liquid add a drop of litmus solution ; neutralize with caustic soda 36°B.* till a lilac colour is obtained ; 2 cc. of a phosphate solution brings the *p*H to 7 ; four drops of an eosin solution are added, the tube is shaken and 3 cc. of chloroform are introduced ; the tube is once more vigorously shaken. The colour of the chloroform is compared with that in the standard tubes, containing known quantities of quinine, which are prepared in exactly similar manner.

N. W.

Malycheva (A. N.). Evaluation comparée de l'efficacité des deux méthodes de traitement de cas aigus de tierce bénigne dans les conditions du nord. [**Comparison of Two Methods of treating Acute Cases of Benign Tertian Malaria in the North.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1938. Vol. 7. No. 5. [In Russian pp. 646–653. French summary pp. 653–654.]

Both methods of treatment involved the use of acriquine. In the first method 0·15 gm. twice a day was given for 7 days ; in the second the same doses were given for 5 days, then 10 days' interval, then the same medication for 3 days followed by a second interval of 10 days, after which the 3 days' treatment was repeated—11 days' treatment in all spread over a month. There were 168 patients treated by the first method, 141 by the second. Two-thirds of the cases were infections of the previous year, that is cases of prolonged incubation or of relapses. The frequency of early relapses in the two groups was almost identical, 33·6 and 35·5 per cent., but the interval between the initial attack and the early relapse was greater in patients who had been submitted to the longer course. Repeated relapses were hardly ever experienced in the prolonged treatment group (only 2 cases) whereas in the 7-day treatment group 13 had 2, and 4 had 3 relapses. *N. W.*

Teichler (Günther). Ueber Atebrinkurzbehandlung bei schwarzen Pflanzungsarbeitern. [**Short Course of Atebrin Treatment for Plantation Coolies.**]—*Arch. f. Schiffs- u. Trop. Hyg.* 1939. Mar. Vol. 43. No. 3. pp. 125–127.

The observations were made on a large sisal plantation in the interior from Tanga, East Africa. The author treated prophylactically 500 natives in this highly malarial district with atebrin on 3 days (1 tablet of 0·1 gm. thrice daily). He inspected in the next week all those who had atebrin and he found that 10 complained of fever, 4 of headache, 1 of giddiness and 1 of weakness, so there was a very small percentage reporting sick. He considers that by giving such short courses of atebrin he can maintain the health of the labour force working in highly malarial districts. It is not to be regarded as a means of systematically eradicating malaria. *E. D. W. Greig.*

[* The terms 65 B. and 36 B. refer to the Beaumé density scale. H_2SO_4 at 65°B. represents 89 gm. concentrated H_2SO_4 diluted with 11 gm. water. NaOH at 36°B. represents 30 gm. solid NaOH added to 70 gm. water.]

Chopra (R. N.) & Basu (B. C.). **Studies on the Effect of Anti-Malarial Drugs upon the Infectivity of Patients to Mosquitoes. Part II. "Cilional."**—*Jl. Malaria Inst. of India.* 1938. Dec. Vol. 1. No. 4. pp. 351–352.

Three *P. falciparum* gametocyte carriers were the subjects of experiment; large numbers of *A. stephensi* were fed on them before and after treatment with cilional. A five day treatment consisting of cilional 0·02 gm. with atebrin 0·1 gm. three times a day did not prevent the development of the parasites in mosquitoes. A postscript to the paper states that two further cases were treated with cilional 0·03 gm. three times a day for five days. Crescents had not disappeared on the fourth day but the patients were not infective for *A. stephensi.*

N. W.

Menk (W.) & Mohr (W.). Zur Frage der Wirksamkeit des Prontosils bei akuter Malaria. [**Activity of Prontosil in Acute Malaria.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1939. Mar. Vol. 43. No. 3. pp. 117–125. With 4 figs. [11 refs.]

The authors refer to the work of Diaz de León, van der Wielen and Hill and Goodwin on this subject. They studied the action of prontosil rubrum and prontosil soluble in 10 cases of malaria, 3 of benign and 7 of malignant tertian infections; the former preparation is given orally and the latter by injection. The results with both drugs in the treatment of malaria were unsatisfactory and they did not confirm the more satisfactory results obtained by Diaz de León and Goodwin and Hill. The explanation of the difference lay either in a difference in the malaria parasite strains or in the immunity of the patient; the authors consider the latter the most probable explanation. However the results should not interfere with further research on the action of sulphonamide bodies in malaria and possibly they might be found to have an action on the cycle of the malarial parasite in the reticulo-endothelial cells. *E. D. W. Greig.*

Farinaud (E.) & Ragiot (Ch.). Recherches sur l'emploi des dérivés de la sulfamide dans le traitement du paludisme. [**Sulphamide Derivatives in the Treatment of Malaria.**]—*Bull. Soc. Path. Exot.* 1938. Dec. 14. Vol. 31. No. 10. pp. 907–910.

Three malaria patients, infected with *P. falciparum*, *vivax*, and *malariae* respectively, were treated with intravenous injections of soluseptasine, 10 cc. morning and evening, for 10 days. Regular counts of parasites were made throughout the treatment. In the *falciparum* case schizonts had completely disappeared on the 6th day but gametocytes increased in number and were very numerous on the 10th day. In the *vivax* case there were 2,200 schizonts and 49 gametocytes at the beginning of treatment; the blood was clear of parasites on the 5th day. In the *malariae* case treatment appeared to diminish the number of schizonts which were however still numerous at the end of treatment; the drug had no demonstrable effect on *malariae* gametocytes. All three were mild cases. The author concludes that the schizonticidal action of soluseptasine justifies the inclusion of that drug in the list of anti-malaria remedies *N. W.*

VAN RIEL (J.). Essai de traitement de la malaria par le cuprochin. [**Experimental Treatment of Malaria with Cuprochin.**]—*Ann. Soc. Belge de Méd. Trop.* 1938. June 30. Vol. 18. No. 2. pp. 339–342.

Cuprochin was formerly known as Paludex and several reports have been published concerning its value as an antimalaria remedy [this *Bulletin*, 1937, Vol. 34, p. 596, 597]; now Paludex consists of one part quinine and two parts cuprochin. Cuprochin is cuprooxyquinoline sodium disulphonate. The author treated 14 adults suffering from *falciparum* malaria of average severity with cuprochin. Each patient had a twenty day course of treatment, one gram a day for patients weighing from 41 to 50 kgm., the dose being increased for those of greater weight. Parasites persisted throughout the treatment; in six cases gametocytes appeared during treatment. From the clinical point of view the drug was equally ineffective. Four children were also treated with no better results; they all lost weight and the malaria persisted. *N. W.*

SERRA (G.). L'utilité de la splénocontraction dans le paludisme chronique avec splénomégalie. [**Value of Splenocontraction in Treatment of Chronic Malaria with Enlarged Spleen.**]—*Ann. Soc. Belge de Méd. Trop.* 1938. Sept. 30. Vol. 18. No. 3. pp. 501–507. [24 refs.]

With experience of some twenty recently treated cases the author writes enthusiastically of the value of Ascoli's method of treatment which he regards as a most important addition to malaria therapy. He confirms the favourable results obtained by many other workers. *N. W.*

RUSSELL (Paul F.). **Malaria due to Defective and Untidy Irrigation. A Preliminary Discussion.**—*Jl. Malaria Inst. of India.* 1938. Dec. Vol. 1. No. 4. pp. 339–349. With 22 figs. on 11 plates. [22 refs.]

Interesting quotations from reports, some of which are nearly a hundred years old, show with what persistence the association of irrigation with malaria has been stressed by public health workers. In spite of this the author's observations have led him to believe that the situation as regards malaria and irrigation is probably worse to-day than ever before; irrigation malaria not only persists but is being made a greater problem each year.

During the last 80 years the Government of India has spent a hundred million pounds on irrigation projects; crops raised on land thus irrigated are now worth some 66 million pounds a year. India has been a leader in fundamental research in irrigation, and in every aspect of malariology. There has been almost complete failure to integrate in practice these two subjects.

It is not irrigation, but defective irrigation, that produces malaria. The author has been engaged on the study of this problem in a part of the Tanjore District in the south of the Madras Presidency [see this *Bulletin*, 1939, Vol. 36, p. 131]. He has on his staff an entomologist, a physician trained as a malariologist, an agronomist investigating the relationship between farming, irrigation and malaria, and an engineer

with experience of irrigation and agricultural engineering. Attention is called to the following malaria-producing defects in construction, operation and maintenance of an irrigation system, all of which are well illustrated by photographs :—defective sluice gates ; seeping canal banks ; borrow pits; defective distributing chambers ; excessive supply of water frequently seen in canals ; improper delivery of water, into a roadway or ditch for example ; improperly maintained canal banks and canal beds ; absence of any planned or controlled system of field channels ; insufficient number of bridges across canals with resulting breaching of canal banks ; absence of drainage canals, perhaps the most important defect ; cutting off and leaving sections of old canals in the line of a new one ; rise in subsoil water caused by a barrage ; and general untidiness. In the district under study a dry taluk has become a wet one during the irrigation season ; rice is now cultivated ; fallow fields remain wet for a longer time than formerly ; rivers and tanks carry more water and are empty for a shorter time ; the subsoil water has risen ; wells which formerly contained water to a level of 35–40 feet below ground now have an average water level of less than 10 feet, and in some seasons less than a foot below ground level ; unplanned streams and channels have become numerous ; ditches are full of water, as are borrow-pits, throughout the irrigation season. Engineers cannot be held responsible for all these undesirable products of an irrigation system.

Detailed specific corrective or preventive technique for dealing with irrigation malaria will be considered in future publications. In the meantime the author urges the need for organization and co-operation of the many agencies interested, especially for more active and more practical co-operation between malariologists and irrigation engineers. *N. W.*

Scharff (J. W.). **Some Methods of Malaria Control.**—*Jl. Malaya Branch Brit. Med. Assoc.* 1938. Dec. Vol. 2. No. 3. pp. 165–168.

Afanassiev (S. F.). **The Employment of the Distillate of Coke Filters for the Destruction of the Larvae of** *Anopheles maculipennis.* **Preliminary Communication.**—*Med. Parasit. & Parasitic Dis.* Moscow. 1938. Vol. 7. No. 5. [In Russian pp. 694–700.]

The object of the experiments recorded in this paper was to test the efficacy of a cheaper substitute for petroleum in combating anopheline larvae. The author employed the distillate of coke filters obtained in the final stages of fractional distillation of Russian petroleum. The distillate is composed of heavy oils (including solar oil) and represents a mixture of various hydrocarbons, mainly aromatic compounds.

In a laboratory experiment the distillate sprayed over the surface of the water in a vessel containing 60 larvae of *A. maculipennis* killed all of them in one hour. When applied to natural reservoirs containing mosquito larvae the distillate caused the destruction of all the larvae, and of other aquatic animals, except crustaceans and Gambusia, in 24 hours. It is concluded that the distillate provides a satisfactory substitute for petroleum and can be used for oiling in the same doses (from 25 to 50 grams per square metre, according to the amount of vegetation present). *C. A. Hoare.*

Roy (D. N.). **On the Control of Malaria-Mosquitoes in Bengal by the Use of Predacious Fish and on the Habits of Two of them.**—*Jl. Malaria Inst. of India.* 1938. Dec. Vol. 1. No. 4. pp. 405–416. [11 refs.]

Observations on the habits of two small fish, common in Bengal, are recorded:—*Panchax panchax* and *Barbus phutunio*. The first named is the most useful of the indigenous species in antilarval work. The author concludes, however, that the rôle it plays is of very limited value. *A. philippinensis* and *A. varuna* are the two tank breeding vectors against the larvae of which the fish would be expected to be most effective. During the malaria transmission season the tanks in Bengal are heavily overgrown with vegetation, the presence of which affords protection for the larvae against the depredations of fish.

N. W.

ENQUIRIES.

Requests for information are constantly being received by the Bureau of Hygiene and Tropical Diseases. As the replies to some of these may be useful to others as well as the individual enquirer, it has been decided to publish selected answers from time to time.

Request.—"I should be grateful for any reference in the literature which you may be able to give me to the viability of helminthic ova in sewage after tank treatment."

Reply

1. McVail (J. B.). Preliminary Note on Septic Tank Latrines in Relation to Hookworm Disease.—*Indian Jl. Med. Res.* 1922. Apr. Vol. 4. pp. 806–808.
   [See *Trop. Dis. Bull. Sanit. Suppl.* 1922. June 30. p. 126.]
2. Khalil (M.). The Relation of Sewage Disposal to the Spread of Helminth Infections in British Guiana.—*Jl. Helminthology.* 1924. Vol. 2. Nos. 4 & 5. pp. 175–190.
   [See *Trop. Dis. Bull.* 1925. Vol. 22. p. 455.]
3. Khalil (M.). The Pail Closet as an Efficient Means of controlling Human Helminth Infection as observed in Tura Prison, Egypt, with a Discussion on the Source of Ascaris Infection.—*Annals of Trop. Med. & Parasit.* 1931. Vol. 25. pp. 35–62.
   [See *Trop. Dis. Bull.* 1931. Vol. 28. p. 665.]
4. Hirst (L. F.). Hookworm Disease and Ceylon Sewage Works.—*Ceylon Jl. of Science.* Sect. D., Med. Science. 1932. Vol. 2. No. 5. pp. 245–275.
   Abstract taken from *Biol. Abst.* 1933. No. 18832.

"A remarkable outbreak of dermatitis occurred in May, 1919, among a gang of 11 coolies digging trenches in which sludge from septic tanks had been buried at least 3 years before. While no explanation is available for this initial outbreak, the author's studies here on sludge and effluents from central sewage treatment works and in controlled experiments contain numerous observations of interest in this field. Ova closely resembling *Necator americanus* have been found in the silt of the main sewers and

sumps of the pumping station, the highest count being 250 eggs per gm. of sludge (DCF). Hookworm larvae were only occasionally detected in the main drainage system, though larvae of free-living nematodes were common. Sludge from the two-story septic tanks of the main treatment works yielded a mean count of 28 hookworm ova per gm. (infective larvae were cultured from this sludge), as well as many Ascaris and Trichuris ova. The highest count of hookworm eggs obtained from sewage entering these tanks was 330 per litre, though typical hookworm larvae were seldom detected here. ' It is very roughly estimated that 1/3 of the hookworm ova passed by the population of Colombo City reach the septic tanks of the sewage treatment works in a recognizable condition.' In an experimental sewage treatment plant the rate of elimination of hookworm eggs from asylum sewage (2,100 inmates) was studied in the effluent of 3 double-story Imhoff pattern tanks in series. A characteristic test showed that passage through the first of 3 similar tanks reduced the hookworm ova in a representative 24-hour sample of sewage to 1·9% of the original count of 15,500 per litre. The effluent from the second tank showed a further reduction to 0·6%, the third tank to 0·4%. About 30 hookworm eggs per liter were present in the final effluent after passage through 3 tanks in series and a rubble bed during a flow through period of 41 hrs. Ascaris and Trichuris eggs were also very much reduced, although the quantitative test applied is not to be considered as accurate. The rate of elimination of hookworm eggs at each stage of the treatment was correlated with that of the suspended solids. Attempts to accelerate the death rate of ova in drying sludge through the use of de Saussure boxes (entrapping solar heat), were promising. Suggestions are made for the design and operation of sludge pans with a view to combining the functions of drying and heating to the best advantage."

[See also *Trop. Dis. Bull.* 1932. Vol. 29. p. 757.]

5. Vassilkova (Z.). Sur la déshelminthisation des eaux d'égout épurées par méthodes intenses.—*Medical Parasitology & Parasitic Diseases.* 1936. Vol. 5. No. 5. pp. 657–673. [In Russian.]

Abstract taken from *Dept. Scient. & Indust. Res. Water Pollution Research. Summary of Current Literature.* 1938. Nov. No. 1529.

" Sewage and sludge from the biological purification plant of Toula, and from the aeration plant of Kojoukhov (Moscow) were examined for helminthic ova. Nearly 2,000 ova belonging to 5 species were found per litre of crude sewage. The Imhoff tanks removed 97 per cent. of these ova, and the secondary sedimentation tanks 87 per cent. of the remainder. Biological filters only reduced the numbers by 18–26 per cent. Chlorination did not affect the vitality of the ova. The sludge contained up to 466 ova per gm.; 20 per cent. of these were destroyed by anaerobic digestion. In sludge kept in the open the ova did not disappear completely for 2 years ; use of sludge as fertiliser may therefore cause contamination of vegetables. To obtain better removal of the ova the author advises longer periods of settling, filtration through sand, and an increase in the temperature of the digestion tanks to 45°C."

[See also *Trop. Dis. Bull.* 1937. Vol. 34. p. 794.]

6. Vishnevskaya (S. M.). The Degree of Dehelminthisation of Sewage at Kharkov Bio-Station.—*Medical Parasitology & Parasitic Diseases.* 1938. Vol. 7. No. 3. pp. 450–454. [In Russian.]

Abstract taken from *Helminthological Abst.* Vol. 7. Pt. 4. No. 362b.

" Vishnevskaya reports on the helminth eggs (Ascaris, Trichuris, Hymenolepis and Taenia) recovered from Kharkov sewage at various stages in its treatment and disposal, which here involves anaerobic sludge digestion and aeration of the liquid in sprinkling filters. The concentration of eggs falls from 66 per litre in the crude sewage to 2 per litre in the effluent. Eggs were present in all the sludges, in scum from the methane

tank, and in the zoogloeal film from the filters. Even in sludge fields of 4 years standing, Ascaris eggs were present at a depth of 1 metre in a concentration of 7 per g."

7. Rudolfs (Willem). Hookworm in Sludge.—*Engineering News-Rec.* 1937. Nov. 4. Vol. 119. No. 19. p. 762.
[See *Trop. Dis. Bull.* 1938. Vol. 35. p. 672.]

REVIEWS AND NOTICES.

Scott (H. Harold) [C.M.G., M.D., F.R.C.P.Lond., D.P.H., D.T.M. & H. Camb., F.R.S.E., Director, Bureau of Hygiene & Tropical Diseases, etc.]. **A History of Tropical Medicine. Based on the Fitzpatrick Lectures Delivered before the Royal College of Physicians of London, 1937–38.** Vol. 1. pp. xix+1–648. Vol. 2. pp. iv+649–1165. With 13 plates. 1939. London: Edward Arnold & Co. [Two Vols. 50*s*.]

This great work is based on the Fitzpatrick Lectures which the author delivered before the Royal College of Physicians in 1937–38.

A careful perusal of the preface will enable the reader to form some conception of the task which Scott has undertaken. Here we read: "With regard to choice of subject in my case, fortunately, there was no difficulty; the difficulty is in the fulfilment. Here and there scattered in medical works dealing with diseases in the tropics we find a few notes on the history of these diseases but, speaking in any sense other than the narrowest, there is no history of the rise and development of tropical medicine and yet the subject is of absorbing interest. It is a most fascinating occupation to study the early, vague, empirical ideas as to the causation of a disease, to trace the beginnings of rational thought thereanent, the interpenetration of scientific notions and empiricism, the progressive clarification of the haze of doubt to the final solution of the problem.

"In the case of so-called Tropical Medicine the difficulty has been the greater because it has necessitated tracing back, in some instances, to times of savagery, the earliest available records, and to legends prior to record. In others the first traces had to be sought in articles, in books, in references in foreign languages, works attainable with much difficulty and often only in garbled or mutilated copies the originals of which had been lost."

Another and very real difficulty with which the author was confronted is that we have no definition of the term "Tropical Medicine." He shows that if we accept its narrow interpretation as "diseases restricted to the tropics" we could with close approximation to the truth say that it is non-existent. If the interpretation be extended to "diseases met with in warm climates" we have to include nearly all the ills that flesh is heir to; and almost equal difficulties are encountered if it be decided to deal with *prevailing diseases* in warm climates. The task which the author has set himself is not to give a history of diseases of warm climates, but a history of tropical medicine

in the generally accepted sense ; the former would have necessitated going over ground already well covered—a discussion of malaria, plague and perhaps other diseases from the dawn of history—but the latter is the rise and development of tropical medicine. Its starting point is the time " when reason began to throw its light upon and illumine the darkness of empiricism, when people began to theorize regarding causation of disease, to consider the problems scientifically and that rarely takes us back more than a hundred to a hundred and fifty years." The author has, however, frequently found it necessary to refer to times long antecedent to this, because some of the modern ideas on aetiology, pathogeny and treatment originated in ancient empiricism and their history would be incomplete if such were disregarded.

The general plan which Scott has kept before him in writing this History is as follows :—As a preliminary he describes from the medical point of view the state of some of the countries when they first came under European rule, and by this means indicates the nature of the problems which arose and the conditions under which their solutions had to be undertaken. He then traces how improvements have been brought about, usually starting with the health of the European officials and traders, and subsequently with that of the natives ; he shows how local preventive measures have expanded to include public health on a wider scale, how philanthropy has made an ever-increasing claim on the governing race, and finally how the welfare of the native has come to take first place.

Such is the task which Scott has set himself, and how well he has accomplished it the reader must judge for himself, as it is quite impossible for a reviewer to give more than a bird's-eye view of the contents of these two large volumes.

The first two chapters deal with the progress of hygiene in the Navy and Mercantile Marine from the early days when commerce was all and the lot of the sailor quite a secondary consideration, and with the conditions under which the soldier lived during the eighteenth and nineteenth centuries. Chapter 3 depicts the conditions of the people and the prevailing diseases to which they were liable in the tropical and subtropical colonies a century or a century and a half ago ; and Chapter 4 deals similarly with India and Australasia. These four chapters, which are copiously illustrated by most interesting and pertinent quotations, make fascinating reading.

Chapters 5 to 19 are concerned with great diseases of the tropics, *viz.*—malaria, blackwater fever, yellow fever, trypanosomiasis, leishmaniasis, leprosy, cholera, plague, undulant fever, relapsing fever, melioidosis, dengue, amoebiasis, ankylostomiasis, and the tropical diseases connected with food. It may at first sight seem strange that of all the worm diseases ankylostomiasis alone finds a place in this formidable list. But Scott tells us that it is the only helminthic infestation of man in the tropics which can be said to have a history of sufficient interest to call for any detail.

It would, of course, be presumptuous for any reviewer to express an opinion whether these chapters give an adequate and accurate account of the history of all the great diseases with which they deal. Undoubtedly there are individuals who have made a historical study of one or two of them, but it would require the united efforts of many such experts to produce a critical review of any value of volumes covering such an immense field.

But although the present reviewer must freely admit that he has no expert knowledge of the history of any of the important tropical diseases, the fact that he has, since the first appearance of this *Bulletin*, been responsible for the summaries of blackwater fever and sleeping sickness papers, entitles him to claim some acquaintance with the literature of these diseases. It was, consequently, with special interest that he examined the chapters devoted to them, and he was well repaid. Something was learned, much that was half forgotten was recalled to mind, and wherever statements and data were tested, they were found to be accurate.

Next follow three delightful chapters devoted to the Suez Canal, the Panama Canal and the slave trade and disease ; and finally there is a chapter consisting of brief sketches of the lives of a few of the more important or better known of those who have devoted their chief interests to tropical medicine, *viz* : Bontius, Bruce, Carroll, Cruz, Dutton, Findlay, Garcia da Orta, Gorgas, Lazear, Leishman, Lind, Manson, Noguchi, Reed, and Ross. As is shown by the names selected for this special notice, and by the list of authors consulted, which is given at the end of the volumes, Scott has not failed to give due credit to workers of all nations.

The reviewer finds it quite beyond his powers to do justice, within the compass of a short review, to this monumental work, which is truly remarkable, not only for its wide learning, but equally for its general interest and the delightful manner in which its stories are told. It is doubtful whether anyone but the Director of the Bureau of Hygiene and Tropical Diseases could have written such a book ; and it is certain that everyone who acquires these two volumes will read them with pleasure and with profit. *W. Yorke.*

Amsterdam. **Acta Conventus Tertii de Tropicis Atque Malariae Morbis. Pars I. Acta Conventus Tertii de Tropicis Morbis.** 720 pp. Ill. **Pars II. Acta Conventus Tertii de Malariae Morbis.** [Transactions of the Third International Congresses in Malaria and Tropical Diseases.]—601 pp. Ill. 1938. Amsterdam : Societas Neerlandica Medicinae Tropicae.

Neither of these volumes can be reviewed in the accepted sense of the term. Each contains matter of great scientific value and should be kept for reference, as denoting the state of knowledge, towards the end of 1938, of the many subjects dealt with.

Previous Congresses in Tropical Medicine had been held in 1913 and 1928, and the third was arranged for 1932 but had to be postponed. Malaria Congresses had been held in Rome in 1925, in Algiers in 1930 and a third was to take place in Madrid in 1935, but it too had to be postponed owing to the unrest in Spain. The two Congresses were, therefore, held simultaneously in Amsterdam in September 1938, under historical conditions of great political unrest and, in fact, were nearly brought to naught after the first two days on that account.

These two volumes record the papers read—more than a hundred in all—and the discussions which arose out of them. Some sixty in Volume I deal with tropical conditions, the chief of which are deficiency diseases, filariasis, plague and yellow fever, and forty-two in Volume II with various aspects of malaria, its epidemiology, parasitology, treatment and control in different countries.

Professor C. D. DE LANGEN undertook the task of editing all these for publication, together with giving an account of the introductory and concluding ceremonies and addresses—a task which must have entailed much irksomeness and real hard work, but which has been accomplished in a way which could not have been surpassed. To him, therefore, are due the very hearty congratulations and thanks of all those who attended the Congresses and who have thereby become recipients of these excellent volumes of reports. *H. H. S.*

PETROV (V. P.). **Kala-Azar (Visceral Leishmaniasis).** Thesis for M.D. Medical Institute, Tashkent. 265 pp. With 71 figs. [680 refs.] [In Russian pp. 1–258. English summary pp. 259–263.]

This publication, representing the author's thesis for M.D., is actually intended to be a text- or handbook on kala azar. In illustrating various aspects of the disease the author has drawn largely upon his own clinical experience (657 cases), a course which will probably be appreciated by Russian physicians practising in the affected areas of U.S.S.R. Since some of the data relating to that country are scattered in various publications and are sometimes inaccessible, they will be briefly summarized here for the benefit of those not conversant with the Russian language. The first two chapters are devoted to the history and distribution of kala azar. In the Soviet Union this disease occurs east and west of the Caspian sea: in Transcaucasia (Armenia, Georgia and Azerbaidjan) where 300 cases have been recorded, and in Middle Asia (Tashkent, Kokand, Samarkand, Katta-Kurgan, Shahrisabzeh, Bokhara, Tchardjo, Kerki, Ashkhabad, and in the Kushka, Takhta–Bazar, Kashka–Daria, Surkhan–Daria and Andijan districts), with about 2,000 cases. Oriental sore and canine leishmaniasis occur in the same regions, sometimes in separate foci, sometimes overlapping the areas of distribution of kala azar. (The distribution of leishmaniases in U.S.S.R. is illustrated by a map.) Chapters 3 and 4 deal with the aetiology and transmission of kala azar. The most important vector in Middle Asia is *Phlebotomus papatasii*, in addition to which the following fifteen species have been recorded in U.S.S.R.: *P. sergenti*, *P. s.* var. *alexandri*, *P. caucasicus*, *P. squamipleuris*, *P. major*, *P. chinensis*, *P. submaricus*, *P. wenyoni*, *P. perfiliewi*, *P. pawlowsky*, *P. kandelaki*, *P. borowsky*, *P. graecowi*, *P. sogdianus*, *P. minutus*. In chapters 5 and 6 an account is given of the epidemiology and clinical course of kala azar. Like some other Russian workers the author believes that canine and human visceral leishmaniases are intimately connected. In Middle Asia the seasonal incidence of kala azar coincides with the winter and spring months. The disease is more common in children under 6 years (about 90 per cent.), the incidence in those under 3 years being the highest (56·8 per cent.). The age-distribution is thus similar to that in the Mediterranean region. The next chapter (7) deals with the methods of diagnosis. For direct examination the author strongly recommends gland and sternal punctures, in preference to spleen-puncture; as regards serological methods he has obtained consistently good results with complement fixation, while the various biochemical reactions were found to be unreliable. The last three chapters (8, 9, 10) are devoted to pathology, therapy and prophylaxis. There is an extensive bibliography, including 219 Russian references. The handbook will be of real value to Russian practitioners in the endemic

regions, while the foreign reader will find in it useful local data, some of which have been briefly mentioned above. The author is not to be blamed for the external appearance of the book, the poor quality of the paper and the defective reproduction of some of the illustrations.

C. A. Hoare.

MEIJER (Frans Hendrik). **Onderzoek van vibrionen uit Nederlandsch-Indië en den Hedjaz.** [Examination of Vibrios from Netherlands India and the Hedjaz.] [Thesis for Doctorate of Medicine at Amsterdam University.]—155 pp. With 1 plate. [9 pages of refs.] English summary. 1939. N.V. Uitg.-Mij. C. A. J. van Dishoeck Bussum.

The title of this thesis does not fully indicate the scope of the monograph, which is very largely devoted to a critical examination of the El Tor vibrio question. That question forms at the present time one to which it is very desirable that a satisfactory answer should be given and it is the endeavour of the author to prove that the El Tor produces a different disease from the cholera vibrio. He has considered and included a great deal of the work of others in his thesis, while his own work is skilfully interwoven with the text of the several chapters. These chapters comprise :—Introduction ; Technical methods ; Vibrios isolated in Batavia ; Strains isolated at Mecca ; Recognition of the cholera vibrio ; Diseases caused by vibrios other than the cholera vibrio ; Summary and conclusion. The summary and conclusion, which is in French and English as well as in Dutch, represents a great deal of the author's own opinions and work. A long and very useful bibliography completes the thesis.

In Batavia 20,444 samples of faeces were examined and these were divided into one group of 14,854 sound persons, that is to say with no abdominal condition, and a group of 5,590 patients. A further group was constituted by samples of surface and well waters. The healthy group provided 54 vibrios and the patient group 46 vibrios. Not a single typical agglutinable El Tor vibrio was found. The vibrios isolated from the patient group, in contrast to the healthy individual group and the water group, was very homogeneous. All the strains of the group gave a positive cholera red reaction, liquefied gelatin in 1 to 3 days, showed haemolysis in blood broth usually in one day and for the greater part did not ferment mannose and arabinose.

Of the vibrios isolated in Mecca 14 were from water and 11 from faeces. One of these, M 28, was a typical El Tor vibrio, belonging to group I of GARDNER and VENKATRAMAN. It came from the well known Zam Zam well. All the other Mecca strains gave much the same reaction as the Batavia patient group.

Haemolytic power is one of the chief features by which the El Tor and most of the water vibrios may be distinguished from the true cholera vibrio. It has again been shown that this property remains constant. If blood be added to bouillon cultures of haemolytic vibrios, those which have been incubated for 24 hours only at 37°C. show haemolysis, but with the increase of the incubation, say to 5 days, the addition of blood is no longer followed by haemolysis. One explanation of this is that haemolysin (" exohaemolysin ") is destroyed by the digestive ferment possessed by vibrios. Even the true cholera vibrio is haemodigestive when freshly isolated. Haemodigestion, therefore, has to be taken into account in determining haemolytic effect of an

El Tor vibrio and even of water vibrios. This difficulty can be got over by using blood bouillon instead of solid media for test, because in this case digestion does not take place. DE MOOR found that haemodigestion only took place in the presence of oxygen and devised the method of incubating blood agar plates *in vacuo* to get rid of the disturbing effect of digestive action. This he did in determining the character of what is now called *V. celebes*. Still another method of separating the two properties of haemolysis and haemodigestion is that of VAN LOGHEM, who found that all vibrios having digestive power lose it slowly with continued subculture. van Loghem also explains the so-called " late " haemolysis of the cholera vibrio as due to an endohaemolysin, not an exohaemolysin, and accounts for its appearance by the liberation of endotoxin with the death of vibrios. Its appearance can be delayed by delaying the death of the vibrios. In his own work the author confirms what is called the phenomenon of GISPEN, who claims to have discovered a serological difference between *V. El Tor* and *V. cholerae*. A suspension of the former heated for 3 hours at 56°C. still remains agglutinable, whilst the latter becomes inagglutinable. A similar result is obtainable by treating suspensions with chloroform. " Finally the toxicity in regard to the white rat is a point of difference between the two vibrios." Intracutaneous injection of cholera vibrios produces little or no effect but necrosis and inflammation follow the injection of El Tor and water vibrios.

It is still a matter of uncertainty how far the El Tor vibrio is to be reckoned with as a producer of disease. Such disease as it may produce seems to be quite independent of cholera. This leads the author to maintain " that enteritis choleriformis El Tor is not the same disease as cholera and consequently the international regulations laid down for cholera are not applicable to the El Tor disease." *W. F. Harvey.*

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